

REGISTER


—OF THE—

BALTIMORE POLYTECHNIC
INSTITUTE

1912-1913

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BALTIMORE POLYTECHNIC INSTITUTE—NORTH AVENUE

ANNUAL REGISTER

—OF THE—

Baltimore Polytechnic Institute

200-240 E. NORTH AVENUE

TWENTY-EIGHTH
ACADEMIC YEAR

1912-1913

PRESS OF
MEYER & THALHEIMER
1913

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BALTIMORE POLYTECHNIC INSTITUTE.

HISTORICAL SKETCH.

The Baltimore Polytechnic Institute, a secondary technical school maintained by the City of Baltimore, was the second educational institution in the United States to establish manual training as a part of the course of a public school system.

Although it is believed that tentative efforts to ingraft manual training upon the city's school system were made as early as 1873 or 1874, yet the action which led to the establishment of this school was not taken until April, 1883. At a meeting of the Board of Commissioners of Public Schools, held on the 24th of that month, Mr. Joshua Plaskitt, Commissioner for the Ninth Ward, offered a resolution for the appointment of a committee "to consider . . . the advisability of establishing a school or schools for manual training." The resolution was adopted, and the committee thus appointed recommended the establishment of a school "for manual education." The necessary enabling ordinances and enactments having been passed by the City Council of Baltimore and the General Assembly of Maryland, the school was organized and opened on February 26th, 1884, under the name of "Baltimore Manual Training School," with Dr. R. Grady as Director.

In January, 1886, the faculty was reorganized, Lieut. John D. Ford, an officer of the Engineer Corps of the United States Navy, who had been detailed for duty at the school, becoming Principal.

From the opening of the school applicants for admission had been required to pass through the eighth grammar school grade, or to show satisfactory evidence of having

had equal instruction; but in September, 1888, it was decided to admit pupils of the sixth, seventh and eighth grammar grades. This action opened the school to so large a number of young boys that increased accommodations became imperative, and in June, 1890, a new building, devoted to the academic studies and drawing, was finished and occupied.

Lieut. Ford was recalled to the naval service in June, 1890, and was succeeded as Principal by John W. Saville, a retired member of the Engineer Corps of the Navy.

In May, 1893, the name of the school was changed to "Baltimore Polytechnic Institute," and the title of Principal and Vice-Principal to President and Vice-President respectively.

Mr. Saville resigned in August, 1899, and was succeeded as President by Lieut. William R. King, Engineer Corps, U. S. N., the present head of the school.

The new charter of Baltimore, which went into effect on March 1st, 1900, provides that the Mayor of the city shall appoint, as the head of the Department of Education, a Board of School Commissioners composed of nine persons, to serve without pay, and to be chosen from among those citizens he deems "most capable of promoting the interests of public education by reason of their intelligence, character, education, or business qualifications." The names of the distinguished citizens now serving as Commissioners will be found on page 16.

Another provision of the charter requires that "in order to secure the continuance of local interest in, and oversight of the public schools, there shall be appointed by said Board of School Commissioners such number of unpaid School Visitors as may be found requisite."

The members of the original Board of Visitors had no sooner acquainted themselves with the general conditions prevailing in the school—the age and attainments of the pupils of the lower grades, the character of the work done, and the scope of the curriculum—than they submitted to the Board of School Commissioners a very comprehensive

and exhaustive report discussing the conditions, needs, and aims of the school, and recommending certain changes in the requirements for admission, and in the curriculum. The partial adoption of this report in September, 1900, excluded grammar school pupils from the Institute, thus making the standard for admission the completion of the course prescribed for the elementary schools.

In April, 1901, a further consideration of the report of the Board of Visitors led to the practical addition of one year to the course by permitting graduates to remain for a year of post-graduate work; and in May, 1902, the length of the course was, by action of the Board, set at four years for pupils entering on and after September 15, 1902.

It was further provided that pupils leaving the Institute before the completion of the course should receive certificates of the work done by them up to the time of their withdrawal.

By operation of the new charter the titles of President and Vice-President were changed, in 1900, to Principal and Vice-Principal.

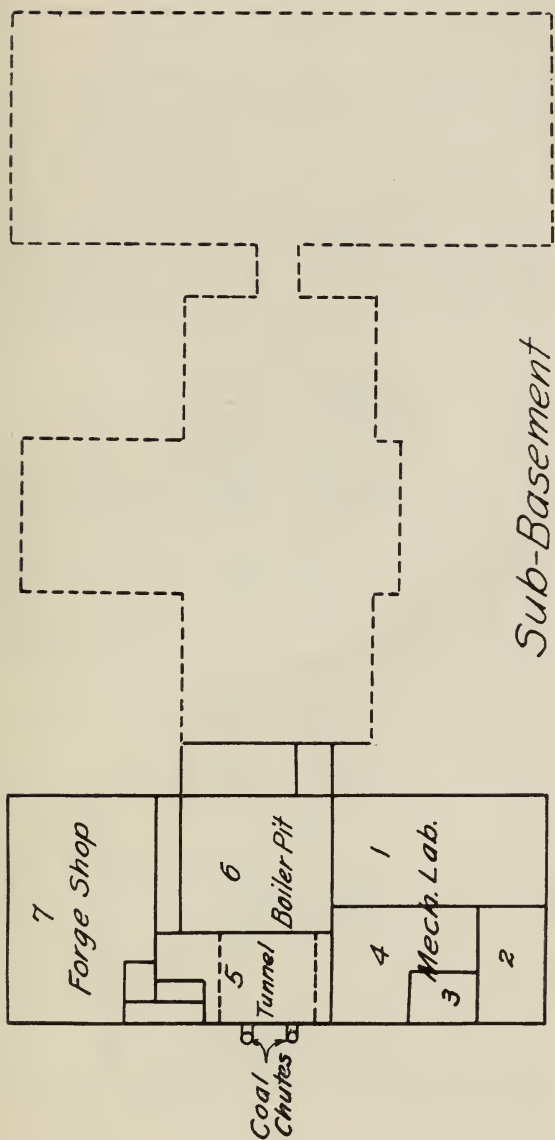
The enrollment becoming greater than the buildings on Courtland street could accommodate, No. 46 Grammar School on Division street was fitted as an annex in 1908, and in September of that year the first-year class was there accommodated.

In order to provide for the continued growth of the Institute, the City Council, by an ordinance approved April 19, 1909, directed the Mayor, the City Comptroller, and President of the Board of School Commissioners to acquire by purchase the property on North avenue then occupied by the Maryland School for the Blind. That property, containing nearly six acres, was subsequently purchased for \$345,000, and plans were instituted for the erection of a building to provide for an ultimate accommodation of 2,000 pupils.

The main building on the North avenue property, formerly the Maryland School for the Blind, having been altered in accordance with the architect's plans for the new Institute, the

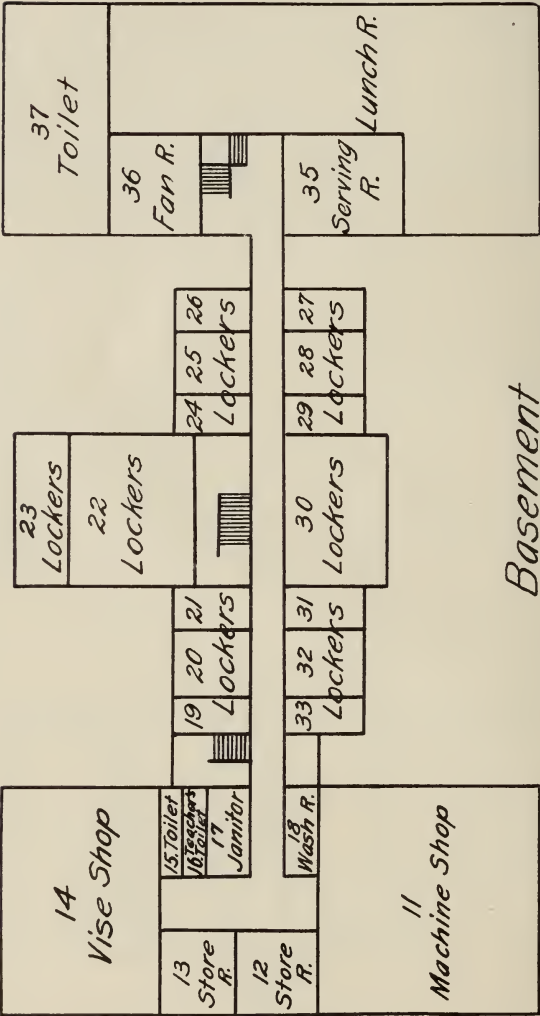
first-year class was moved there from the Division street annex on December 5, 1910.

On March 17, 1911, ground was broken on the North avenue site for a new building to accommodate 1,300 students, and it is expected to be ready for occupancy in September, 1913. The frontispiece is a general view of the building and grounds and shows the stage of completion of the structure on January 1, 1913. On pages 11, 12, 13, 14 and 15, are shown the floor plans from which a conspectus of the work of the school may be obtained.



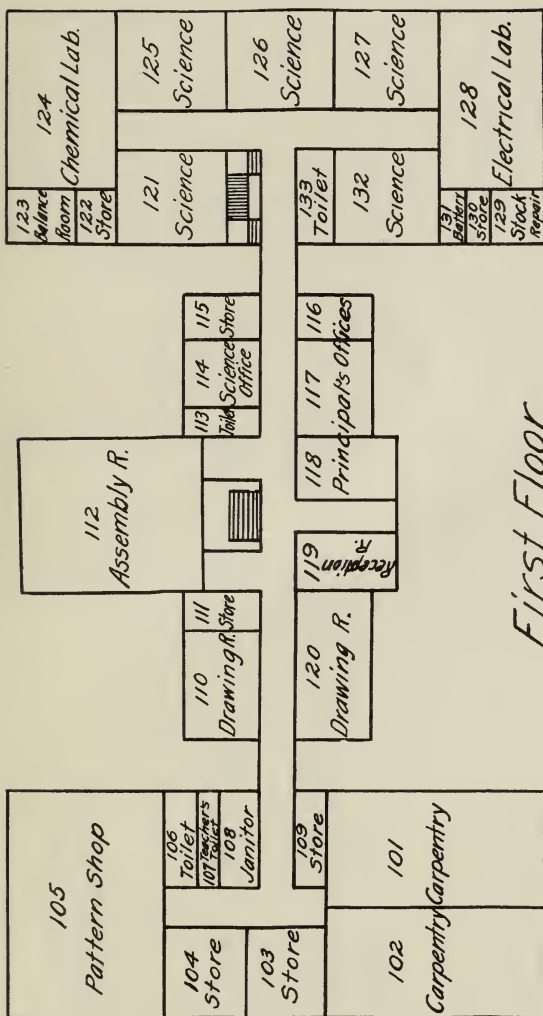
Sub-Basement

FLOOR PLANS OF NEW POLYTECHNIC INSTITUTE.



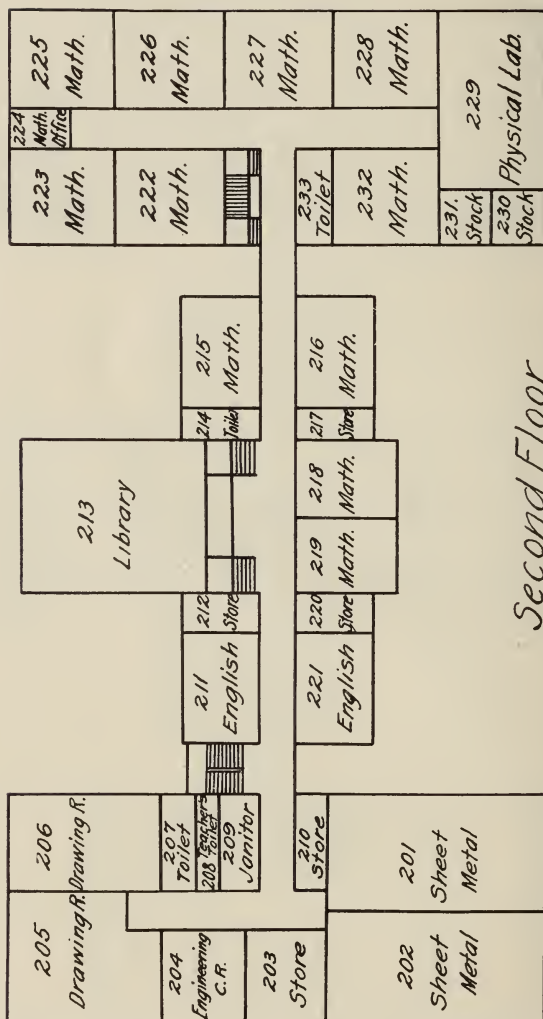
Basement

FLOOR PLANS OF NEW POLYTECHNIC INSTITUTE.



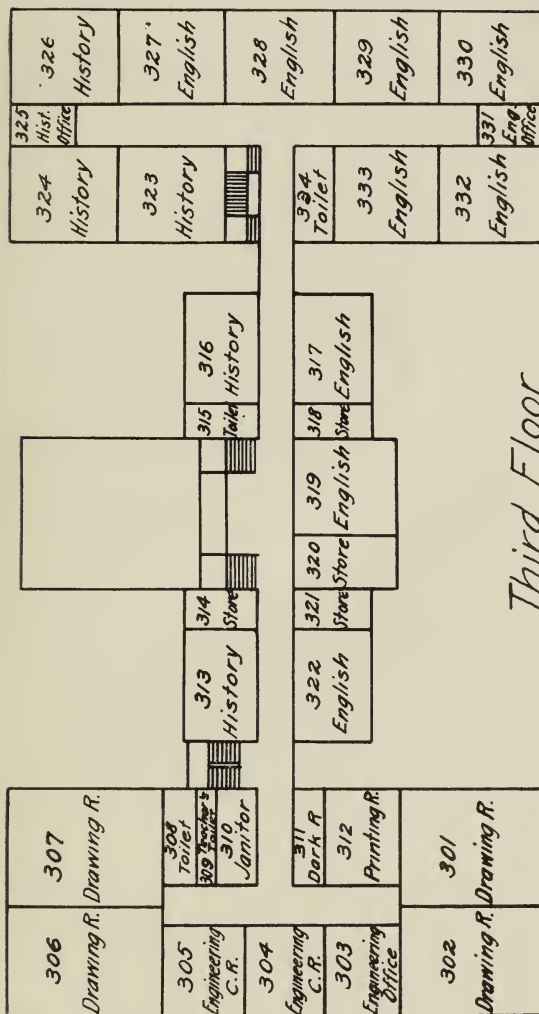
First Floor

FLOOR PLANS OF NEW POLYTECHNIC INSTITUTE.



Second Floor

FLOOR PLANS OF NEW POLYTECHNIC INSTITUTE.



Third Floor

FLOOR PLANS OF NEW POLYTECHNIC INSTITUTE.

BOARD OF SCHOOL COMMISSIONERS.

THOMAS McCOSKER, *President*,
JAMES M. DELEVETT,
ALBERT T. CHAMBERS,
HENRY JOESTING, JR.,
SIDNEY P. THANHOUSER,
RICHARD J. BIGGS,
ALBERT L. FANKHANEL,
COL. CLARENCE DEEMS,
ARTHUR B. BIBBINS.

BOARD OF VISITORS.

ABRAM H. COLMARY, *Chairman*,
FREDERICK W. WOOD,
FREDERICK J. MAYER,
JAMES L. MURRILL,
WILLIAM H. ROTHROCK,
MENDES COHEN,
FREDERICK H. WAGNER.

SUPERINTENDENT OF PUBLIC INSTRUCTION.

FRANCIS A. SOPER.

RECORD OF THE FACULTY AND STAFF.

ARRANGED IN ORDER OF APPOINTMENT.

William R. King, Passed Assistant Engineer, U. S. N. (retired), U. S. N. A., 1875. Principal and Head of Department of Engineering, September 1, 1899; relinquished duties of Head of Department of Engineering, September, 1911.

William H. Hall, B. C. C., 1885; A.M., Washington College, 1906. Assistant in Department of Science, September 23, 1886; Head of Department of Science, September 13, 1899; Vice-Principal, January 1, 1912.

William G. Richardson. Assistant in Department of Engineering, February, 1887.

J. Ward Willson, B. C. C., 1861; M.D., Baltimore University, 1889. Assistant in Department of English and Modern Languages, March 21, 1889.

George M. Gaither, B. M. T. S., 1888. Assistant in Department of Engineering, April 1, 1889; Supervisor of city manual training centers in addition to Institute duties, September, 1902.

Samuel M. North, B. C. C., 1887; B.S., Columbia University, 1912. Assistant in Department of Mathematics, September, 1894; Head of Department of English and Modern Languages, September 13, 1899.

Samuel P. Platt. Assistant in Department of Engineering, October 1, 1897.

Oliver Bacharach, B. C. C., 1897. Assistant in Department of Mathematics, April, 1898.

J. Edward Broadbelt, B. M. T. S., 1890; Ph.G., Maryland College of Pharmacy, 1893. Assistant in Department of Science, September, 1898.

J. Montgomery Gambrill, B. P. I., 1897. Assistant in Department of English, June 11, 1902; resigned in 1904 to become Assistant State Superintendent of Education in Maryland; Head of Department of History and Civics, September, 1906; on leave of absence, 1912-1913.

Charles Ernest Conway, B. P. I., 1902. Assistant in Department of Engineering, June 11, 1902; at Lehigh University, 1903-1904; Assistant in Department of Engineering, 1904-1905; Assistant in Department of Engineering, September, 1907; Head of Department of Engineering, February 1, 1912.

Irving L. Twilley, A.M., Washington College, 1892. Assistant in Department of English, September, 1903; transferred to Department of Science, June, 1904.

Henry A. Converse, A.B., Hampden-Sidney College, 1893; Ph.D., Johns Hopkins University, 1903. Assistant in Department of Mathematics, May, 1904; resigned, September 1, 1906, to accept the chair of Mathematics at Davis and Elkins College; Assistant in Department of Science, June, 1908; Acting Head of Department of Mathematics, February 10, 1909; Head of Department of Mathematics, September, 1909.

Edward Reisler, A.M., Western Maryland College, 1888. Assistant in Department of English, May, 1904.

Elmer M. Harn, A.B., Rock Hill College, 1892; A.M., Rock Hill College, 1895. Assistant in Department of English, July, 1904.

Isaac L. Otis, A.B., New York University, 1899. Assistant in Department of English, September, 1904; Assistant in Department of History and Civics, September, 1906.

Allen L. Malone, B. P. I., 1902; at Cornell University, 1902-1903 and 1903-1904. Assistant in Department of Engineering, October 1, 1904.

Allan B. Souther, B.S., Harvard, 1897. Assistant in Department of Engineering, October, 1905.

Harvey S. Houskeeper, A.B., Lehigh University, 1872. Assistant in Department of Mathematics, September, 1906.

Henry Bogue, Jr., A.B., Johns Hopkins University, 1899. Assistant in Department of Engineering, September, 1906.

Thomas F. Garey, A.B., Washington College, 1904; Washington Normal School, 1905; A.M., Washington College, 1907; LL.B., University of Maryland, 1907. Assistant in Department of Mathematics, November, 1906.

William H. Wilhelm, A.B., B.S., St. John's College, 1893; A.M., St. John's College, 1896. Assistant in Department of Mathematics, June 12, 1907.

James B. Arthur, B. P. I., 1904. Assistant in Department of Science, September 25, 1907.

William P. Stedman, A.B., Trinity College, 1905. Assistant in Department of English and Modern Languages, February 12, 1908.

Charles Frederick Ranft, A.B., Johns Hopkins University, 1902. Assistant in Department of History and Civics, June, 1908.

Philip Dougherty, B.S., Trinity College, 1907; A.M., Columbia University, 1909. Assistant in Department of History and Civics, June, 1908. Acting Head of Department of History and Civics, 1912-1913.

George N. Anderson, Pratt Institute, 1908. Assistant in Department of Engineering, September, 1908.

Clarence P. Bolgiano, B. P. I., 1908. Laboratory Assistant, September, 1909; Assistant in Department of Engineering, February 1, 1912.

Laurance F. Magness, B. P. I., 1907. Assistant in Department of Engineering, September, 1909.

Alfred B. Haupt, B. C. C., 1906; A.B., Johns Hopkins University, 1909. Assistant in Department of Mathematics, October, 1909.

George H. Schwartz, B. C. C., 1905; A.B., Johns Hopkins University, 1908. Assistant in Department of English, September, 1910.

Walter F. Shenton, B.S., Dickinson College, 1907; A.M., 1909. Substitute in Department of Mathematics, September, 1911.

Harry C. Finck, B. P. I., 1906. Assistant in Department of Engineering, September, 1911.

W. W. Baden, A.B., Johns Hopkins University, 1881; Ph.D., 1892. Substitute in German, September, 1911.

Howard H. Elliott, B. P. I., 1911. Graduate Assistant in Department of Engineering, September, 1911; Laboratory Assistant in Department of Science, February 1, 1912.

Julius Zieget, B. P. I., 1907; C.E., Cornell University, 1910. Assistant in Department of Engineering, February 1, 1912.

J. Vinton Hobbs, B. C. C., 1894; M. S. N. S., 1897; Columbia University Summer School, 1907-1908-1909. Assistant in Department of Science, February 1, 1912.

Charles E. Adams, B. C. C., 1898; intermittent work at University of Chicago, 1906-1911. Assistant in Department of English, March 1, 1912.

E. Howard Askew, Science Laboratory Assistant, April, 1912.

Rosa Lebovitz, E. H. S., 1911. Secretary, June, 1912.

Wilmer A. Dehuff, B. P. I., 1907; C. E., Cornell University, 1910. Assistant in Department of Engineering, June, 1912.

Max F. Lehman, A.B., Lebanon Valley College, 1907; A.M., University of Pennsylvania, 1911. Assistant in Department of Mathematics, June, 1912.

Charles A. Pettit, B. P. I., 1903. Assistant in Department of Engineering, June, 1912.

Harry Primrose Porter, A.B., Washington College, 1905; A.M., Columbia University, 1912. Assistant in Department of English, August, 1912.

A. E. Sable, Cumberland Valley State Normal School, 1907; B.S., C.E., Bucknell University, 1911. Assistant in Department of Mathematics, August, 1912.

Charles F. Goob, B. P. I., 1901; Laboratory Mechanician, September, 1912.

W. T. Ballard, B. P. I., 1911; Cornell University, 1911-1912. Graduate Assistant, Department of Engineering, 1912-1913.

Rudolph Michel, B. P. I., 1912. Graduate Assistant in Department of Engineering, September, 1912.

Charles E. Dennis, Jr., B. P. I., 1912. Graduate Assistant in Department of Engineering, September, 1912.

James Neville Galloway, A.B., Randolph Macon College, 1908; Graduate Student, Johns Hopkins University, 1911-1912. Assistant in Department of Mathematics, October, 1912.

H. L. Caples, M.S.N.S., 1900; A.B., Johns Hopkins University, 1908. Assistant in Department of English, February, 1913.

Emory H. Niles, B. P. I., 1909; student, Johns Hopkins University, 1909-1913; Rhodes Scholar, Oxford University, England, 1913-1916. Substitute in Department of English, February, 1913.

Ferdinand C. Kuehn, B. C. C., 1908; A.B., Johns Hopkins University, 1911; Graduate Student, Johns Hopkins University. Substitute in Department of English, February, 1913.

FACULTY.

WILLIAM R. KING,
Principal.

WILLIAM H. HALL,
Vice-Principal,
Head of Department of Science.

SAMUEL M. NORTH,
Head of Department of English and Modern Language.

J. MONTGOMERY GAMBRILL,
Head of Department of History and Civics.
(On leave of absence.)

HENRY A. CONVERSE,
Head of Department of Mathematics.

CHARLES E. CONWAY,
Head of Department of Engineering.

PHILIP DOUGHERTY,
Acting Head of Department of History and Civics.

ROSA LEBOVITZ.
Secretary.

FACULTY AND STAFF BY DEPARTMENTS IN ORDER OF APPOINTMENT.

DEPARTMENT OF ENGINEERING.

CHARLES E. CONWAY, *Head of Department.*

WILLIAM G. RICHARDSON,
GEORGE M. GAITHER,
SAMUEL P. PLATT,
HENRY BOGUE, JR.,
ALLAN B. SOUTHER,
ALLEN L. MALONE,
GEORGE N. ANDERSON,
LAURANCE F. MAGNESS,
HARRY C. FINCK,
CLARENCE P. BOLGIANO,
JULIUS ZIEGET,
WILMER A. DEHUFF,
CHARLES A. PETTIT,
CHARLES F. GOOB,
W. T. BALLARD,
RUDOLPH MICHEL,
CHARLES E. DENNIS.

DEPARTMENT OF MATHEMATICS.

HENRY A. CONVERSE, *Head of Department.*

OLIVER BACHARACH,
WILLIAM H. WILHELM,
HARVEY S. HOUSKEEPER,
THOMAS F. GAREY,
ALFRED B. HAUPT,
MAX F. LEHMAN,
A. E. SABLE,
JAMES N. GALLOWAY.

DEPARTMENT OF SCIENCE.

WILLIAM H. HALL, *Head of Department.*

J. EDWARD BROADBELT,
IRVING L. TWILLEY,
JAMES B. ARTHUR,
J. VINTON HOBBS,
HOWARD H. ELLIOTT,
E. HOWARD ASKEW.

DEPARTMENT OF ENGLISH AND MODERN LANGUAGE.

SAMUEL M. NORTH, *Head of Department.*

J. WARD WILLSON,
EDWARD REISLER,
ELMER M. HARN,
WILLIAM P. STEDMAN,
GEORGE H. SCHWARTZ,
W. W. BADEN,
HARRY P. PORTER,

IRENE REINER, *Theme Reader.*

DEPARTMENT OF HISTORY AND CIVICS.

PHILIP DOUGHERTY, *Acting Head of Department.*

ISAAC L. OTIS,
CHARLES F. RANFT,
CHARLES E. ADAMS.

CALENDAR FOR SCHOOL YEAR 1912-1913.

September 16, Monday....Opening of Session.
November 22, Friday.....First Quarter ends.
November 25, Monday.....Second Quarter begins.
November 28, Thursday..Thanksgiving Day.
December 20, Friday.....Christmas Vacation begins.
January 6, Monday.....Session resumed.
January 17, Friday.....Semi-annual Examinations begin.
February 7, Friday.....Second Quarter ends.
February 10, Monday.....Third Quarter begins.
March 20, Thursday.....Easter Vacation begins.
March 25, Tuesday.....Session resumed.
March 28, Friday.....Third Quarter ends.
March 31, Monday.....Fourth Quarter begins.
April —, Friday.....Arbor Day.
May 21, Wednesday.....Annual Examinations begin.
May 30, Friday.....Decoration Day.
June 17, Tuesday.....Commencement Day.
September 15, Monday....Opening of Session.
November 21, Friday.....First Quarter ends.
November 24, Monday...Second Quarter begins.
November 27, Thursday..Thanksgiving Day.
December 24, Wednesday.Christmas Vacation begins.

COURSE OF STUDY AND GENERAL STATEMENT OF PLAN AND PURPOSE.

The course of study for the Baltimore Polytechnic Institute is designed to accomplish the following purposes:

1. To give a sound fundamental education to pupils whose inclinations and other circumstances preclude a college course.

2. To give to youth that healthful and highly valuable manual training which broadens education, and conduces to dexterity, contrivance, and invention.

To this end, the time usually devoted to Greek and Latin is employed, during two years of the course, in carpentry, sheet-metal, and light forge exercises. The exercises cover what is known as Manual Training, and are given with special reference to their educational value.

3. To give to students in the third and fourth years such studies in Engineering, Mathematics, Physics, and Chemistry, and such mechanical exercises in Applied Manual Training as will fit them:

- (a) For immediate and remunerative employment in the wide field of civil, mechanical, and electrical engineering, where, it is believed, their training will lead to rapid advancement.

- (b) For entrance to advanced standing into a higher institution of technology, should a higher technical education be desired.

For the attainment of these objects there is one carefully planned general course of study, no effort being made to specialize until the fourth year, by which time a student will have acquired a considerable degree of practical skill and intimate knowledge in some one of the professions based on mechanical art and applied science that he may have

elected to follow. Thus, in the fourth year in the subject of Design, the student may select examples of mechanical, electrical, or civil engineering design, the amount of such practice being limited only by the capacity of the student and the time available. Extra opportunities in the laboratories are offered advanced students for more extended investigations than those demanded by the course.

No attempt is made to teach trades, but the equipment is of such nature that the instruction given in the shops is designed to be correlative to the work of the classroom, and results are aimed at that will insure success in mechanical pursuits subsequent to graduation. It is believed that instruction in correct methods of using tools, and practical illustrations of how, and for what purpose, things are done, are of more value than mere excellence in hand skill.

In the department of English and German, instruction in English is given throughout the four years, and in German throughout the first three. The course in English comprises the theory and practice of composition and the reading and study of selections from representative British and American authors, including the college entrance requirements. The work in composition is designed to give the student a practical knowledge of the ordinary forms of discourse and to train him in expressing his thoughts with ease and accuracy. To this end he is given frequent exercise in writing, the subjects, for the most part, being taken from his daily experience and from his work in the other departments of the school. The course in literature is designed, not only to meet the college entrance requirements, but to cultivate in the student such tastes as will lead him in his reading to choose books that are worth while.

The course in German comprises drill in the fundamental principles of grammar, and as wide a reading as is possible in selected texts. The course is not designed to give a speaking knowledge of the language, but such knowledge as will enable the pupil to read German easily, and successfully to pursue advanced courses in the study of the language.

In the Department of History and Civics, instruction is given during the first and second years. The course includes about one-half the work prescribed by the Committee of Seven, the first year being devoted to English History, and the second year to American History and Civics.

In Mathematics, care is taken at the beginning of the first year to discover and correct any defects in fundamental training, after which the course of instruction proceeds in Algebra, Geometry, Trigonometry, Analytic Geometry, Descriptive Geometry, and the Differential and Integral Calculus, the completeness of the course enabling the graduate to read understandingly a treatise on any of the mechanical sciences.

In the Department of Science, the work of the second and third years in Physics embraces the properties of matter and elementary mechanics, the instruction being accompanied with lectures illustrated by experiments and with practical work in the laboratory. The instruction of fourth-year students in this subject is confined to Heat and Electricity. The dynamic theory of heat, the conversion of heat into mechanical work, and the thermo-dynamics of the steam engine are the particular features of the fourth year in the study of Heat.

In Electricity, the work of the fourth year consists of practical applications of the theoretical study of the second and third years, and of commercial electricity. Electric lighting, both arc and incandescent, is discussed from constructive and economic standpoints, and the advantages of high tension distribution of electric power are demonstrated. The dynamo and motor are treated in detail—operating, designing, and winding being carefully considered. The experimental equipment for this work is installed partly in the mechanical laboratory as stated below. There are also installed in the electrical laboratory a 2 k. w. rotary converter, a 2 H. P. motor, a 2 k. w. generator, a small motor-generator set, other small motors, and lamps of the arc and mercury vapor types. These appliances, with the electric light equipment of the Institute, present opportunities for the operation of electrical machinery and for the detection of defects and faults to be

overcome. Alternating currents are treated both mathematically and experimentally, and converters, motors, impedance coils, and measuring instruments are used by students for verifying laws and descriptions given in lectures. The switchboard and the generator plant afford opportunities for power station practice, and the electric railway is treated in a practical manner. The newest and best methods of telegraph and telephone construction are presented. Special features of the course are the various tests for insulation resistance of conductors, the tests for grounds, faults and short circuits on lines, and the treatment of the defects in the dynamo and motor, and remedies therefor.

For the study of Chemistry there are chemicals and apparatus in the laboratory to give to the third year students instruction concerning the nature and reaction of the chemical elements and their compounds, and to students of the fourth year a brief course in qualitative and quantitative analysis, the compounds formed in the various reactions and their chemical equations being particularly emphasized.

In the Department of Engineering, the instruction given the fourth year students in theoretical and applied mechanics embraces the laws of equilibrium and motion; center of gravity; friction; principles of work; moment of inertia; mechanics of materials; graphic methods of determining stresses in beams and framed structures; and an elementary study of the stresses and deformations produced in standard specimens of metal when subjected to tension, compression, and shearing. The work of the third and fourth year students in steam engineering consists of the study of thermo-dynamics of the steam engine in a manner as comprehensive as the facilities of the Institute and the maturity of the students permit. Numerous calculations are made involving engine and boiler efficiencies and proportions, and the study of the indicator is supplemented with practice in taking diagrams, from which the consumption and distribution of the steam and the power of the engine are determined. The advantages and disadvantages of the different kinds of steam boilers are studied, particular

attention being given to boiler attachments. The plant for this work consists of a 100 k. w. Turbo-Generator, a 100 k. w. Corliss driven Generator, an inverted triple expansion engine of 100 I. H. P., an inverted compound engine of 60 I. H. P., a high-speed automatic cut-off engine (Harrisburg Standard) of 46 I. H. P., a horizontal power engine of 25 I. H. P., a 30 H. P. gasoline engine of the Autocar type, a Campbell & Zell sectional boiler (rated at 100 boiler horsepower), two Keeler boilers of 175 H. P. each, and a Roberts safety water tube boiler, capable of generating steam for the production of 120 I. H. P. when used in connection with the triple expansion engine. The engines mentioned were built by the students, the first two after designs of the Bureau of Steam Engineering of the Navy Department. Grouped in the mechanical laboratory are all the engines; a surface condenser; a Riehle testing machine of 50,000 pounds capacity; steam, gas, and coal calorimeters; apparatus for thermal efficiency tests of steam traps; and apparatus for calibrating pressure gauges, thermometers and indicator springs. The compound and triple expansion engines may be worked singly or together in connection with a friction dynamometer specially designed at the Institute, an internal circulation of water in the brake wheel enabling the engine to run continuously in making power tests. The Roberts boiler furnishes steam at 150 pounds pressure per square inch for the stage expansion engines, and at 95 pounds and 40 pounds to the high-speed and power engines, respectively, Foster regulators reducing the pressure as desired. Horizontal and vertical separators are placed in the steam pipes to insure the delivery of dry steam to the engines, and connections are made for calorimeter tests. The surface condenser used in connection with the stage expansion engines may also be connected with the exhaust of the high-speed engine when desired. The water from condensation is delivered to a filter of approved design by a Knowles independent air pump, and thence direct to the boiler either by a Knowles duplex pump or Pemberthy injector. Exhaustive engine and boiler tests for power and efficiency

are made by squads of fifteen of the senior class, the results of which are recorded in standard forms and retained by the students.

In the mechanical drawing room are 168 tables of approved design, and an equipment of instruments and models well adapted to the requirements of an advanced course in the subject. Third year students are required to make a free-hand sketch of the parts of some machine, from which a finished drawing, tracing, and blue print are made. The work of the fourth year students in design tends to make them draftsmen in the true sense—not mere copyists.

The equipment in the machine, pattern, forge, sheet metal, and carpentry shops is equal to that of any similar institution in the country.

THE COURSE OF INSTRUCTION IN DETAIL.

The course extends over a period of 36 effective weeks of instruction, and as here outlined in detail applies to all entries after January 31, 1910, though the students in the Institute who entered previous to that date are pursuing an equivalent course. It is believed that the new arrangement will be more effective, as it advances the modern languages one year, that is, to the first, second, and third years from the second, third, and fourth; and concentrates physics in the second and third years in preference to distributing the subject through the first, second, and third years.

Students completing the full course of the Institute invariably obtain full sophomore standing with some sophomore credits in the courses leading to the degrees of C.E., M.E., and E.E., at Cornell and Lehigh Universities.

DEPARTMENT OF ENGINEERING AND APPLIED MECHANICS.

FIRST YEAR COURSE — D CLASS.

Mechanical Drawing.—36 weeks, 4 periods a week:

Use of instruments; lettering; elementary lessons.

Practice.—36 weeks, 4 periods a week:

(a) Carpentry; 18 weeks, 4 periods a week:

Lectures and exercises in laying out, cutting, framing, and joining wooden members.

(b) Sheet Metal; 18 weeks, 4 periods a week:

Lectures and exercises in soldering, and in sheet metal and venetian iron work.

SECOND YEAR COURSE — C CLASS.

Mechanical Drawing.—36 weeks, 4 periods a week:

Hatching; neatness and accuracy; scale drawing; intersection and development of surfaces.

Practice.—36 weeks, 4 periods a week:

(a) Carpentry; 5 weeks, 4 periods a week:

Review of the work of the first year.

(b) Pattern Making; 13 weeks, 4 periods a week:

Exercises in wood turning and in making simple patterns.

- (c) Forge Work; 9 weeks, 4 periods a week:
Light forging and welding.
- (d) Vise Work; 9 weeks, 4 periods a week:
Exercise in chipping and filing.

THIRD YEAR COURSE — B CLASS.

Steam Engineering.—36 weeks, 4 periods a week:

Types of boilers; boiler details; boiler room auxiliaries; the steam engine; engine details; indicating and governing; governors; valves; condensers; multiple expansion engines; theories of heat; thermodynamics; properties of perfect gases; properties of saturated steam; use of steam tables; combustion of fuel and steam generation; boiler and engine efficiencies; the engine mechanism; slide valve and link motion; duty and efficiency of pumps.

Mechanical Drawing.—36 weeks, 4 periods a week:

Detail drawings of machines from free-hand sketches; the working drawing, tracing and blue print. Descriptive Geometry (see course in Mathematics).

Practice.—36 weeks, 4 periods a week:

- (a) Pattern Shop; 18 weeks, 4 periods a week:
Exercises in making patterns for wrenches, pulleys, eccentrics, pillow-blocks, gears, globe valves, pipe joints, and core boxes where necessary. Lectures on construction and finish of patterns, on the different kinds of molding, and on the operation of the cupola.
- (b) Machine Shop; 15 weeks, 4 periods a week:
Casehardening, and work on the lathe, planer, milling machine, drill-press, shaper and vise.
- (c) Forge Shop; 3 weeks, 4 periods a week:
Forging and tempering machine cutting tools.

FOURTH YEAR COURSE — A CLASS.

The Steam Engine.—22 weeks, 3 periods a week:

The indicator and indicator diagram; measurement of power and of steam consumption; expansion of perfect gases and of steam; the ideal and actual engine; engine and boiler design; valve diagrams; engine and boiler testing; the steam turbine.

The Internal Combustion Engine.—14 weeks, 3 periods a week:

Fuels, carburetors, vaporizers; ignition; cooling; lubrication; governing; indicator cards; efficiency; management; operation; defects and remedies; types of engines; gas producers.

Mechanics.—18 weeks, 5 periods a week:

Kinematics: Motion in a straight line with constant velocity and with constant acceleration; velocity and acceleration curves;

vectors; resolution and composition of displacements, velocities, and accelerations; relative motion; acceleration with variation in direction of velocity; angular motion.

Dynamics: (a) Statics: The parallelogram, triangle, and polygon of forces; composition and resolution of forces; friction; the inclined plane; the screw; parallel forces; moments of forces and of couples; conditions of equilibrium; method of sections; equilibrium under the action of three forces; centre of gravity. (b) Kinetics: The laws of motion; inertia, mass, weight, momentum; work and power of a force and of a torque; potential and kinetic energy; principles of work; centrifugal and centripetal forces.

Mechanics of Materials.—18 weeks, 5 periods a week:

Stress, strain, elastic limit, ultimate strength; calculations involving bending and resisting moments, moment of inertia, radius of gyration, deflection and resilience of simple and cantilever beams and of columns and shafts; bending moment and shear diagrams.

Graphic methods of determining stresses in beams and framed structures by means of the funicular polygon and reciprocal diagram.

Mechanics of Machinery: Transmission of power by means of belts and toothed gears.

Mechanical Drawing and Design.—36 weeks, 4 periods a week:

Mechanical Drawing. The drafting accompanying the work in design; freehand sketches, working drawings, tracing, and blue prints.

Design: Proportioning of machine parts, such as spur, bevel, and worm gearing, belt pulleys, and bearings, from empirical and rational formulas. The application of the mechanics of materials to the design of some part of an engine or tool, such as a traveling crane, cylinder, connecting rod, valve, screw jack. The use of the Zeuner diagram in valve design. The application of graphic statics to the design of roof trusses and bridge members. Students are permitted to select a subject for design from a list of mechanical and electrical devices submitted to them.

Practice.—36 weeks, 4 periods a week.

(a) Machine Shop; 18 weeks, 4 periods a week:

Machine work involving accuracy and finish, such as gear cutting, building and assembling of machinery.

(b) Engineering Laboratory; 18 weeks, 4 periods a week:

Tension, compression, and bending tests with a Riehle machine; calibration of pressure gauges, thermometers, and indicator springs; practice with planimeter; calorimeter tests for quality of steam; calorific value of coal and of gas; valve setting; determining clearance; duty of steam pumps; indicated steam consumption of engines; economy tests of engines, boilers, pumps and steam traps.

DEPARTMENT OF MATHEMATICS.

FIRST YEAR COURSE — D CLASS.

Algebra.—36 weeks, 4 periods a week:

Definitions and notation; fundamental operations; integral linear equations; factoring; highest common factor; least common multiple; fractions; fractional equations; simultaneous linear equations; graphical representation; inequalities; involution; evolution; theory of exponents; surds; quadratic equations.

Geometry.—36 weeks, 3 periods a week:

Geometry of the straight line and circle; proportion; properties of similar figures; original exercises.

Explanation and Demonstration.—36 weeks, 1 period a week:

The most difficult and important features of the course are explained and demonstrated.

SECOND YEAR COURSE — C CLASS.

Algebra.—36 weeks, 3 periods a week:

Review; theory of quadratic equations; variables and limits; indeterminate equations; ratio and proportion; logarithms; variation; arithmetical, geometrical and harmonic progressions; binomial theorem; undetermined coefficients.

Geometry.—18 weeks, 3 periods a week, and 9 weeks, 4 periods a week:

Areas and volumes; lines and planes in space; polyhedrons; cylinder; cone; sphere; original exercises.

Trigonometry.—9 weeks, 4 periods a week:

Functions of the acute angle; the right triangle; use of tables; functions of any angle; relations between the functions of several angles; inverse trigonometric functions.

THIRD YEAR COURSE — B CLASS.

Trigonometry.—18 weeks, 3 periods a week:

General formulas; oblique triangle; miscellaneous examples.

Surveying.—18 weeks, 2 periods a week:

Instruments and their uses; land surveying.

Analytic Geometry.—36 weeks, 4 periods a week:

The straight line; circle; parabola; ellipse; hyperbola; transformation of co-ordinates; construction of loci; higher plane curves.

Descriptive Geometry.—Time taken from mechanical drawing, as it is taught in connection with that subject.

Projections; problems in straight line and plane; projections and sections of solids; curved surfaces and tangent planes; development and projection of screw thread; intersection of surfaces.

FOURTH YEAR COURSE — A CLASS.

Differential and Integral Calculus.—36 weeks, 5 periods a week:

Differentiation of algebraic and transcendental functions; successive differentiation; expansion of functions, including the development of Maclaurin's and of Taylor's theorems; evaluation of indeterminate forms; maxima and minima of functions of one variable, including geometric problems in maxima and minima; differentiation of functions of more than one variable; radius of curvature; tangents and normals; derivatives of arcs; fundamental rules and methods of integration; geometrical application of the calculus to lengths of curves, to areas, to volumes of solids of revolution; integration of trigonometric functions; successive integration; applications to mechanics.

DEPARTMENT OF SCIENCE.

SECOND YEAR COURSE — C CLASS.

General Physics.—36 weeks, 4 periods a week:

During this year the regular high school course in Physics is covered. Derivation of formulae and the solution of problems are required. Emphasis is laid upon such sections as have reference to engineering courses. Experimental demonstration by the instructor is made whenever the subject permits. One period a week is devoted to individual work in the laboratory.

THIRD YEAR COURSE — B CLASS.

Electricity.—36 weeks, 4 periods a week:

Magnetism; galvanometers and other measuring instruments; laws of electrical action; magnetic and electrical units; simple alternating currents; derivation of formulae and practical problems; experimental demonstration by the instructor; individual laboratory work in electrical measurements.

General Physics.—18 weeks, 3 periods a week:

The work in physics is confined principally to advanced study of light and sound, the subjects of dynamics and heat being embraced in the work of the Department of Engineering.

Chemistry.—18 weeks, 3 periods a week:

Recitations in general chemistry with experimental work by the instructor, showing the preparation and reactions of the elements and compounds. Individual work in the laboratory.

FOURTH YEAR COURSE — A CLASS.

Electricity.—36 weeks, 4 periods a week:

Lectures and recitations in applied electricity, including electro-chemical action; principles of the generator, motor, and transformer; railways; line and machine testing; telegraph and telephone; electric lighting. One period a week is devoted to individual laboratory work in measurements, practical testing, and the operation of the generator, motor, and transformer.

Chemistry.—36 weeks, 4 periods a week:

General Chemistry: Practice in stoichiometry; lectures illustrating the theory of chemical action and emphasizing the parts of the subject bearing upon engineering work. Individual laboratory work.

Analytic Chemistry: Qualitative and quantitative analysis, the work of the fourth quarter consisting in the determinations of the substances affecting the quality of iron and steel.

DEPARTMENT OF ENGLISH AND MODERN LANGUAGES.

FIRST YEAR COURSE — D CLASS.

Composition and Rhetoric.—36 weeks, 2 periods a week:

Study of text and frequent written exercises based upon Narration and Description; letter writing.

Literature.—36 weeks, 3 periods a week:

- (a) Study of the following selections: Sketch Book; Snow Bound; Tales of the White Hills; Poems and Tales from Poe; Sir Launfal; Lays of Ancient Rome; Lady of the Lake; Ivanhoe.
- (b) Leading facts in the lives of the authors represented in (a).

German.—36 weeks, 4 periods a week:

Study of the grammar and reading.

SECOND YEAR COURSE—C CLASS.

Composition and Rhetoric.—36 weeks, 2 periods a week:

Frequent written exercises; study of rhetorical principles.

Literature.—36 weeks, 2 periods a week:

- (a) Study of the following selections: Ancient Mariner; Vicar of Wakefield; Deserted Village; Silas Marner; DeCoverley Papers; Merchant of Venice; Palgrave (in part).
- (b) Leading facts in the lives of the authors represented in (a).

German.—18 weeks, 4 periods a week; and 18 weeks, 3 periods a week:

Composition; grammar; reading standard German fiction and simple scientific prose.

THIRD YEAR COURSE — B CLASS.

Literature and Composition.—18 weeks, 2 periods a week; and 18 weeks, 3 periods a week:

Study of the following texts: Julius Caesar; Macbeth; Milton's *L'Alegro*, *Il Penseroso*, *Lycidas*, and *Comus*; Washington's Farewell Address; Webster's First Bunker Hill Oration, or Burke's Speech on Conciliation. Frequent written exercises.

German.—36 weeks, 3 periods a week:

Review of grammar and composition; copious reading in prose and poetry.

FOURTH YEAR COURSE — A CLASS.

Technical Composition.—36 weeks, 1 period a week.

Methods of exposition, and drill in the non-technical discussion of subjects taken from the students' work in the technical departments. Frequent conferences with instructors.

DEPARTMENT OF HISTORY AND CIVICS.

FIRST YEAR COURSE — D CLASS.

History.—36 weeks, 5 periods a week:

English History from its beginnings to the present day. Especial attention is given to the social, economic, and political phases of the subject; and as far as time and the maturity of the pupils permit, attention is directed to the development of Europe as it progressed contemporaneously with England.

SECOND YEAR COURSE — C CLASS.

History and Civics.—36 weeks, 4 periods a week:

American History, with special attention to political development; civil government of the United States and the rights and duties of American citizenship.

TIME DEVOTED TO THE DIFFERENT SUBJECTS COMPRISING
THE FOUR YEAR COURSE.

	NUMBER OF HOURS PER YEAR.				
	1st Year	2nd Year	3rd Year	4th Year	Aggregate
DEPARTMENT OF ENGINEERING					
Carpentry	72	20			92
Sheet Metal.....	72				72
Vise		36			36
Forge		36	24		60
Pattern		52	72		124
Machine			48	72	120
Mechanical Laboratory.....				72	72
Mechanical Drawing.....	144	144	108		396
Descriptive Geometry.....			36		36
Machine Design.....				144	144
Steam and Gas Engines.....			144	108	252
Mechanics				90	90
Mechanics of Materials.....				90	90
DEPARTMENT OF MATHEMATICS					
Algebra	144	108			252
Geometry	108	90			198
Geometry, Analytic.....			144		144
Trigonometry		36	54		90
Surveying			36		36
Calculus, Differential.....				90	90
Calculus, Integral.....				90	90
Explanation and Demonstration....	36				36
DEPARTMENT OF SCIENCE					
Physics		108	54		162
Physics, Laboratory.....		36			36
Electricity			72	108	180
Electricity, Laboratory.....			36	36	72
Chemistry, General.....			36	54	90
Chemistry, Laboratory.....			18	18	36
Chemistry, Analytic.....				72	72
DEPARTMENT OF ENGLISH					
Composition and Rhetoric.....	72	72			144
Literature	108	72	90		270
German	144	126	108		378
Technical Compositions.....				36	36
DEPARTMENT OF HISTORY AND CIVICS					
History	180				180
History and Civics.....		144			144
Total	1080	1080	1080	1080	4320

REQUIREMENTS FOR ADMISSION.

Pupils bearing properly attested certificates of having passed the prescribed Grammar School Course of the Public School System of Baltimore are entitled to enrollment.

Other applicants residing in the city will be admitted after passing an examination covering the requirements of the eighth grammar school grade. Eighth grade grammar school pupils who fail of promotion are not eligible for admission under this requirement. Specimen entrance examination papers covering the requirements of the eighth grade will be found on pages 71 and 72.

After having successfully passed the entrance examination, a non-resident applicant must register as such at the office of the Secretary of the Board of School Commissioners, where he will be furnished with a bill for the first quarterly installment of the annual fee of \$85, and a presentation at the Institute of a coupon from the bill, signed by the City Comptroller, will be accepted as evidence of payment, and entitle the applicant to enrollment.

MERIT ROLLS.

Merit rolls, showing the proficiency of students in each branch of study, are made out annually for the different classes.

Each subject is assigned a coefficient indicative of its relative weight, and the final mark of a student in a subject (on a scale of 100) is multiplied by its coefficient. The sum of the products thus obtained is the final mark of the student in all the subjects for the year. This mark is a certain percentage of the sum of the coefficients, and such percentage is the student's average for the year.

FOURTH YEAR RECORD AND FINAL MERIT ROLL OF THE MID-YEAR GRADUATING CLASS OF 1912.

Order of Merit.	NAMES.	Date of Admission.	Mechanics.		Mechanics Applied to Engineering.	Steam and Gas Engineering.		Mech. Drawing and Design.	Diff. and Integ-ral Calculus.		Chemistry.	Applied Electricity.	French.	Practice.	Department.	Aggregate for 1st Year.	Aggregate for 2nd Year.	Aggregate for 3rd Year.	Aggregate for 4th Year.	Aggregate for Four Years.	Graduating Average.
			7	10	10	10	8	10	10	10	5	5	5	20	40	60	80	200			
15	J. G. Bobb	1905	4.90	7.60	7.00	6.00	7.10	7.70	7.80	4.30	3.50	4.40	15.17	32.27	46.16	61.10	154.70				77.35
7	O. Boucher.....	1907	4.90	8.70	7.60	7.12	7.10	8.00	8.20	4.05	4.30	4.50	15.56	32.25	48.38	64.47	160.66				80.33
21	J. J. Clancy, Jr....	1907	5.32	7.70	7.30	6.08	7.40	7.60	7.50	3.90	3.75	3.35	15.62	31.52	44.52	59.90	151.56				75.78
10	T. E. Cooper.....	1907	4.90	8.90	7.70	6.64	7.00	7.80	7.90	4.65	4.10	4.25	16.07	32.30	46.22	63.84	158.53				79.22
14	J. A. Cullen.....	1907	5.39	8.20	7.90	5.92	7.10	7.60	7.50	3.65	4.35	4.35	14.08	30.72	48.02	61.96	154.78				77.39
11	P. R. Dankmeyer.	1908	4.90	8.40	7.90	6.16	7.30	7.90	7.60	3.90	4.10	4.85	15.80	30.88	47.02	63.01	156.71				78.36
20	P. Darrington....	1907	4.90	7.00	7.00	6.40	7.00	7.20	7.00	3.65	4.20	4.40	15.42	31.10	46.38	58.75	151.65				75.83
6	F. T. Goetze	1908	5.11	8.90	7.70	6.72	7.00	7.80	8.30	4.05	4.15	3.90	16.24	34.06	49.52	63.63	163.45				81.73
19	C. J. Kearney....	1907	4.90	8.40	7.20	6.08	7.10	7.10	7.70	3.75	4.10	-2.10	17.17	34.27	46.30	54.23	151.97				75.99
5	M. Kemp.....	1907	5.67	9.00	8.40	7.12	7.90	8.00	8.20	4.30	4.00	2.60	16.37	33.75	51.34	65.19	166.65				83.33
12	H. F. Krumm....	1906	4.90	7.60	7.40	6.56	7.00	7.70	8.50	3.55	4.20	4.75	14.96	31.59	46.28	62.16	154.99				77.50
13	P. L. Lotz.....	1908	4.90	8.20	7.50	5.84	7.00	7.30	7.90	3.70	4.00	3.25	16.20	31.77	47.38	59.59	154.94				77.47

BALTIMORE POLYTECHNIC INSTITUTE.

FOURTH YEAR RECORD AND FINAL MERIT ROLL OF THE MID-YEAR GRADUATING CLASS OF 1912—Concluded.

Order of Merit.	NAMES.	Date of Admission.	Mechanics.		Mechanics Applied to Engineering.		Steam and Gas Engineering.		Mech. Drawing and Design.		Diff. and Integral Calculus.		Chemistry.		Applied Electricity.		French.		Practice.		Department.		Aggregate for 1st Year.		Aggregate for 2nd Year.		Aggregate for 3rd Year.		Aggregate for 4th Year.		Aggregate for Four Years.		Graduating Average.	
			7	10	10	10	8	10	10	10	10	10	10	5	5	5	5	20	40	60	80	200	100											
*1	F. H. MacCarthy.	1908	4.90	9.30	8.20	6.16	7.30	7.90	4.35	5.00	17.38	33.80	53.14	66.66	170.98	85.49																		
17	W. F. McConnor.	1908	5.39	8.40	7.00	6.16	7.30	7.40	4.25	3.00	15.31	30.64	46.56	60.35	152.86	76.43																		
†23	F. Michel.....	1907	5.11	8.30	7.40	6.96	7.00	7.00	4.30	4.20	15.33	32.90	46.66	61.92	156.81	78.41																		
22	W. J. Parrott.....	1907	4.90	8.00	8.10	6.32	7.30	8.10	3.90	4.30	14.47	30.07	44.08	62.57	151.19	75.60																		
†8	G. H. Porter.....	1907	4.90	8.10	7.60	6.64	7.30	7.00	3.70	3.95	14.04	31.96	45.58	60.99	152.57	76.29																		
2	W. F. Quast.....	1907	5.39	8.70	8.40	6.64	7.50	7.60	4.20	4.30	16.81	34.31	51.94	66.13	169.19	84.60																		
3	H. Schad.....	1908	5.74	9.00	7.60	6.32	7.30	7.90	4.40	4.05	17.69	34.59	50.96	64.91	168.15	84.04																		
4	E. C. Seibert.....	1908	4.90	8.70	8.00	7.20	7.00	7.00	4.10	4.35	17.43	35.36	50.86	63.95	167.60	83.80																		
16	W. T. Snyder....	1907	4.90	8.20	7.50	6.56	7.00	7.60	4.20	4.20	16.38	31.12	44.54	61.56	153.60	76.80																		
9	A. Tobias.....	1908	4.90	9.10	8.00	6.80	7.80	7.40	3.50	4.00	16.05	32.57	47.12	63.95	159.69	79.85																		
8	P. H. White.....	1908	5.60	8.70	7.00	7.04	7.40	7.00	4.40	3.95	16.86	34.34	47.88	60.84	159.92	79.96																		

*Received 85% or more of the aggregate multiple for the entire course.

†Deficient in Chemistry; deficiency made up and diploma awarded in June.

BALTIMORE POLYTECHNIC INSTITUTE.

FOURTH YEAR RECORD AND FINAL MERIT ROLL OF GRADUATING CLASS OF 1912—Continued.

Order of Merit.	NAMES.	Date of Admission.	Mechanics.	Mechanics of Materials.	Steam Engineering.	Mech. Drawing and Design.	Diff. and Integral Calculus.	Chemistry.	Applied Electricity.	German.	Practice.	Department.	Aggregate for 1st Year.	Aggregate for 2nd Year.	Aggregate for 3rd Year.	Aggregate for 4th Year.	Aggregate for Four Years.	Graduating Average.
	MAXIMA.		8	10	12	8	10	8	10	4	5	5	20	40	60	80	200	100
*16	C. E. Dennis, Jr..	1908	6.40	9.20	10.68	7.36	8.20	6.72	8.30	3.56	4.15	4.80	16.22	33.75	51.16	69.37	170.50	85.25
33	R. P. Drenning...	1908	6.40	8.60	9.24	6.88	7.30	6.08	8.30	3.04	4.15	4.75	15.66	31.98	48.58	64.74	160.96	80.48
18	S. H. Eby.....	1908	6.88	8.60	9.84	7.20	8.80	6.48	8.80	3.68	4.40	4.50	16.38	31.38	52.20	69.18	169.14	84.57
24	T. S. Eichelberger	1908	6.72	9.20	9.96	6.72	7.40	6.16	8.90	3.40	4.25	5.00	16.37	33.16	49.18	67.71	166.42	83.21
53	H. Elliott.....	1908	6.40	8.40	9.48	5.92	8.10	5.60	8.00	2.80	4.05	2.05	15.93	29.65	45.23	60.80	151.62	75.81
45	C. C. Emich	1908	6.40	7.70	8.88	5.76	7.40	5.60	7.30	2.92	4.00	4.75	16.25	32.22	46.27	60.71	155.45	77.73
49	H. S. Ewell	1908	5.60	7.20	9.48	6.08	7.00	5.60	7.20	3.28	3.70	3.75	16.11	31.83	47.07	58.89	153.90	76.95
56	C. J. Finnan.....	1907	5.76	8.40	9.00	6.08	8.00	6.08	7.40	3.12	3.90	2.30	14.77	30.95	44.62	60.04	150.38	75.19
32	C. E. Fitzell.....	1908	5.84	8.70	9.48	6.40	7.80	5.60	7.20	3.42	4.35	5.00	16.42	33.60	47.81	63.79	161.62	80.81
*1	A. J. Frey.....	1908	7.52	9.50	11.28	7.60	9.60	7.20	9.40	3.72	4.65	5.00	18.79	37.93	55.57	75.47	187.76	93.88
54	H. Fried.....	1908	5.84	7.00	9.24	5.60	7.20	5.84	7.40	2.92	4.05	5.00	15.45	30.14	45.78	60.01	151.38	75.69

BALTIMORE POLYTECHNIC INSTITUTE.
FOURTH YEAR RECORD AND FINAL MERIT ROLL OF GRADUATING CLASS OF 1912—Continued.

Order of Merit.	NAMES.	Date of Admission.	Mechanics.	Mechanics of Materials.	Steam Engineering.	Mech. Drawing and Design.	Diff. and Integral Calculus.	Chemistry.	Applied Electricity.	German.	Practice.	Department.	Aggregate for 1st Year.	Aggregate for 2nd Year.	Aggregate for 3rd Year.	Aggregate for 4th Year.	Aggregate for Four Years.	Graduating Average.
			8	10	12	8	10	8	10	4	5	5	20	40	60	80	200	100
*4	MAXIMA.																	
	A. D. Fulton.....	1908	6.16	8.50	10.44	7.36	8.30	7.12	8.60	3.56	4.30	5.00	18.26	36.51	52.65	69.34	176.76	88.38
*11	A. Gagneux.....	1908	6.88	8.80	10.32	6.80	8.40	6.88	9.10	3.24	4.40	5.00	17.04	33.06	51.81	69.82	171.73	85.87
43	S. F. Galvin.....	1908	6.40	8.60	9.48	6.40	8.60	5.60	7.30	2.84	3.65	4.60	15.13	30.86	47.05	63.47	156.51	78.26
40	F. T. Gartside....	1908	6.16	8.70	9.00	6.16	8.20	5.92	7.00	3.24	4.15	5.00	15.50	30.41	48.15	63.53	157.59	78.80
50	R. Gover.....	1907	5.60	7.30	8.88	6.40	7.30	5.76	7.40	2.84	3.85	4.25	15.37	32.32	45.82	59.58	153.09	76.55
36	W. S. Graham...	1908	6.40	8.20	10.20	7.04	7.60	5.60	7.40	2.96	4.30	1.60	16.74	33.02	47.80	61.30	158.86	79.43
58	T. W. Hacker.....	1908	5.60	7.00	9.12	5.92	7.00	5.68	7.00	3.24	3.75	4.85	16.83	30.57	42.92	59.16	149.48	74.74
+66	W. J. Heimiller...	1908	5.68	7.70	8.40	5.76	7.60	5.60	7.20	2.80	3.85	3.50	15.42	30.04	44.93	58.09	148.48	74.24
46	K. Heineman.....	1908	6.32	7.70	8.76	6.32	7.00	5.68	7.10	3.36	3.50	5.00	15.84	30.86	47.26	60.74	154.70	77.35
31	J. W. Heisse.....	1908	5.92	8.70	8.76	6.56	7.00	6.16	8.30	3.20	4.20	4.50	16.43	33.73	49.39	63.30	162.85	81.43
20	C. H. Horn.....	1908	6.56	8.50	10.32	7.12	8.60	6.32	7.20	3.60	4.30	4.75	17.63	33.78	49.96	67.07	168.44	84.22

BALTIMORE POLYTECHNIC INSTITUTE.
FOURTH YEAR RECORD AND FINAL MERIT ROLL OF GRADUATING CLASS OF 1912--Continued.

Order of Merit.	NAMES.	Date of Admission.	Mechanics.		Mechanics of Materials.		Steam Engineering.		Mech. Drawing and Design.		Diff. and Integral Calculus.		Chemistry.		Applied Electricity.		German.		Practice.		Department.		Aggregate for 1st Year.		Aggregate for 2nd Year.		Aggregate for 3rd Year.		Aggregate for 4th Year.		Aggregate for Four Years.		Graduating Average.	
			8	10	8	10	8	10	8	10	4	5	5	20	40	60	80	200	100															
19	G. Rasch.....	1908	6.48	8.50	9.48	6.32	7.70	6.72	9.00	3.04	4.00	5.00	17.76	33.77	50.83	66.24	168.60	84.30																
47	J. Riley	1908	5.68	8.00	9.00	5.60	8.30	6.00	7.10	3.20	3.80	3.75	14.57	31.29	47.98	60.43	154.27	77.14																
55	H. F. Roschen ...	1908	5.60	7.00	8.40	6.00	7.00	5.76	7.90	3.04	3.85	3.75	15.22	31.73	45.59	58.30	150.84	75.42																
*10	W. Sandlas.....	1908	6.40	8.80	9.72	6.96	7.50	6.08	8.70	3.36	4.35	5.00	17.43	35.37	52.31	66.77	171.88	85.94																
*3	J. A. Schad.....	1908	6.96	9.10	10.44	6.72	8.60	7.04	9.20	3.56	4.25	5.00	18.62	35.95	53.03	70.87	178.47	89.24																
35	L. A. Schloss.....	1908	6.40	7.60	9.00	6.00	7.40	5.84	7.40	3.32	4.00	5.00	16.56	32.77	48.48	61.96	159.77	79.89																
*13	E. Schmied.....	1908	6.80	8.60	10.08	7.12	7.90	6.96	8.30	3.16	4.10	4.50	17.11	34.94	51.83	67.52	171.40	85.70																
38	H. Schuster.....	1908	6.80	8.80	9.48	5.92	7.70	5.68	7.70	2.92	3.65	2.20	17.55	33.03	46.58	60.85	158.01	79.01																
51	J. A. Sternberg...	1907	5.60	7.20	8.40	6.16	7.10	6.00	7.00	2.92	3.90	3.25	15.42	33.37	46.51	57.53	152.83	76.42																
*8	E. R. Stivers.....	1908	6.64	8.50	8.88	6.96	7.80	6.40	9.00	3.40	4.15	5.00	18.05	35.77	51.42	66.73	171.97	85.99																
42	E. M. Talbott....	1908	5.84	8.40	9.36	6.40	8.60	5.60	7.30	2.80	3.50	4.10	15.89	31.12	47.64	61.90	156.55	78.28																
21	E. J. Thomas.....	1908	6.00	7.60	9.96	7.04	7.20	6.16	8.60	2.80	3.90	5.00	17.69	34.46	51.12	64.06	167.33	83.67																

BALTIMORE POLYTECHNIC INSTITUTE.
FOURTH YEAR RECORD AND FINAL MERIT ROLL OF GRADUATING CLASS OF 1912—Concluded.

Order of Merit.	NAMES.	Date of Admission.	Mechanics.		Mechanics of Materials.		Steam Engineering.		Mech. Drawing and Design.		Diff. and Integral Calculus.		Chemistry.		Applied Electricity.		German.		Practice.		Department.		Aggregate for 1st Year.		Aggregate for 2nd Year.		Aggregate for 3rd Year.		Aggregate for 4th Year.		Aggregate for Four Years.		Graduating Average.	
			8	10	10	12	8	10	8	10	8	10	8	10	4	5	5	20	40	60	80	200	100											
25	MAXIMA.																																	
	F. C. Traub.....	1908	6.40	8.70	9.84	6.80	8.00	6.32	8.50	3.12	4.60	17.35	32.59	50.17	66.08	166.19	83.10																	
62	O. Travers.....	1908	5.60	7.20	9.36	6.32	7.10	5.76	7.10	3.00	2.10	15.03	27.73	43.61	64.06	143.41	71.71																	
*2	J. L. Walsh.....	1908	7.60	9.50	11.40	6.96	9.30	7.12	9.50	3.40	5.00	17.71	35.55	53.07	74.28	180.61	90.31																	
*9	S. Walter.....	1908	6.40	8.90	9.60	6.88	8.00	6.48	8.00	3.56	5.00	17.76	35.59	51.42	67.12	171.89	85.95																	
**64	R. Ward.....	1908	5.68	7.70	9.60	6.48	7.00	6.16	8.00	3.08	3.70	16.77	34.12	49.13	61.40	161.42	80.71																	
29	C. B. Watkins....	1908	6.40	8.40	9.48	6.64	7.80	6.16	7.60	3.16	4.35	17.49	33.74	47.88	63.99	163.10	81.55																	
26	J. S. Webb.....	1908	6.40	8.80	9.96	7.04	8.10	6.08	8.70	3.12	5.00	16.24	31.32	49.85	67.30	164.71	82.36																	
59	O. Webster.....	1908	5.60	7.90	9.72	6.08	7.20	5.92	7.00	2.80	4.70	14.59	30.46	43.44	60.62	149.11	74.56																	
34	R. T. Wisthoff....	1908	6.16	7.60	9.50	6.48	7.60	6.00	7.40	3.56	3.65	16.84	32.88	48.47	61.60	159.79	79.90																	
22	T. R. Wolfe.....	1908	6.00	9.10	9.48	6.64	8.30	6.00	9.10	3.00	5.00	16.93	34.39	48.92	66.87	167.11	83.56																	
52	E. C. Zscheuschler	1907	6.56	8.40	9.00	6.16	9.00	5.92	7.00	3.44	-0.40	16.85	32.46	44.24	59.13	152.68	76.34																	

* Received 85% or more of the aggregate multiple for the entire course.

** Deficient in Calculus, deficiency made up in September and diploma awarded.

† Deficient in German; deficiency made up in September and diploma awarded.

‡ Deficient in Mechanics of Materials; deficiency made up in September and diploma awarded.

ADDRESS TO GRADUATES

ADDRESS.

To the Graduating Classes of 1912 of the Baltimore Polytechnic Institute
by R. KEITH COMPTON, *Chairman of the*
Baltimore Paving Commission.

LADIES AND GENTLEMEN :

It is with great pleasure that the speaker appears before the graduating classes of an institution with whose pupils he has been associated in the engineering profession for a period of twenty-two years.

As an introductory to the very brief remarks which, owing to the very kind and highly appreciated invitation from your Principal, I have the honor to deliver this evening, I wish to congratulate the members of the graduating classes on the successful completion of a course in engineering which ranks with the first year's work of the leading technical institutions of this country.

A number of you young men will be so fortunate as to enter upon the second-year work of some higher engineering institution, where, with the exercise of the same energy and zeal which has resulted in your receiving diplomas this evening, in about three years, you will earn a degree in some particular branch of engineering. Others of you will be compelled immediately to enter the employ of some corporation or private individual, in a profession involving everything of a material nature pertaining to the progress, development, and convenience of mankind; and to those young men I wish to avail myself of this opportunity to say that some of the leading engineers of this and other countries have never received a degree, but have obtained their experience and reputation by strict application to their work and by "hard knocks."

In the words of a distinguished gentleman, the definition of your chosen profession is about as follows: "Engineering is the art and science of directing the great sources of power and materials in nature for the use and convenience of mankind by means of the practical application of the most important principles of natural philosophy and of the laws of mechanics." It has many branches: Civil, electrical, mechanical, and marine, each one of which comprises many sub-branches, but I believe all practical men agree that it is well for a young man to decide upon what principal branch he may wish to follow, and then "stick to the limit." But no matter which branch you select, it will be necessary, and indeed to your material welfare, for you to start in

a position where the remuneration and responsibility may appear insignificant and entirely out of accord with your own individual ideas.

Unduly high estimation of their own ability means the failure of many young engineers, for as soon as this belief becomes imbedded in a young man's mind, faithfulness, loyalty, and efficient service become secondary objects. During these days, months, and—sometimes—years of discouragement, which come to most of us, always bear in mind this one fact: Promotion is bound to come to the man who, by strict application to his work, becomes proficient therein, and is at the same time truthful, steadfast, and loyal to his employer, to himself, and to his profession.

The young man who persistently and faithfully lives up to these cardinal principles can, when he is later placed in a position of trust and responsibility, "snap his fingers in the face of anyone who dares to endeavor to win him (the engineer) away from what may be the best interest of his employers, whose interest he is paid to protect, and whose interest he is honor bound to protect by all the laws of God and the civilized world.

Think more of your reputation and self-respect than you do of money, and in the long run, a reputation for honesty, fairness, and justice to all with whom you may officially come in contact, will do more than anything else to promote your professional interest. Always carry yourself with reserve; and above all, do not be conceited. Let loyalty and faithfulness be your standards, and give your employer all your energy. Do not waste his time and yours by so conducting yourself of an evening as to be unfit for duty on the following day.

If you ever feel that your environment and surroundings are unpleasant or distasteful, then the proper course is to seek other employment which you may think will be more congenial to you.

It is a very mistaken idea for a young engineer, employed in a minor capacity, to get the impression that he is employed to see that his employer gets the best of a deal at the expense of someone else. Take, for instance, a young inspector employed on contract work. The specifications and contract have been drawn, and he is placed on the work to see that the contractor lives up to his agreement. He is not there to violate the contract, even though such violation may appear to be in the best interest of his employer; but at the expense of the contractor. He is not there to cause the contractor to lose money, but rather to assist him in interpreting intelligently the terms of the contract—subject, of course, to orders and explanations from his immediate superiors. In other words, there are many positions in which an engineer is placed for the purpose of deciding upon what is fair and just to all concerned. When so placed, he should be careful so to conduct himself as to be entirely free from any influence which may place him in a compromising and biased position in making such decisions.

Do not endeavor to make a good showing to your employer by causing the contractor to do unnecessary and impracticable things; your employer may decide that *you* are not only impractical, but "cranky," and dispense with your services for the good of the work.

Do not figure at the start that the contractor is disposed to be "crooked," but keep an eye on your man; endeavor to induce him to live up to his agreement, and gradually you will be able to discover his traits without unnecessarily making an enemy of him.

The inspector who exercises good judgment, often called "horse sense," is of more use to his employer than is the one who is unfair and impractical, though he may be a graduate of the finest technical institution in this country.

Sometime ago Prof. Benjamin, of Purdue University, wrote to several employers requesting information concerning the engineering graduate and the world. This is one of the replies he received:

"The question of advancement in our company—which would mean considerable responsibility, as compared with the smaller companies—depends largely upon the personality, executive ability, and general character of the man. A person may have exceptional ability from a technical standpoint and yet be unfit for a position which requires oversight of a large number of men, or judgment from the executive or business standpoint. I can only suggest that men be advised to develop a pleasing personality, executive ability, and ability to get along with and handle men."

Furthermore, in this investigation, the Professor tells the story of the young graduate who consults a jeweler concerning the design for a class pin. The story is as follows: Said the young graduate: "We should like to have the design show a graduate viewing the universe, and we think the figure should occupy about three-fourths of the field and the universe the rest."

If I can go away this evening feeling that some of my humble remarks have become imbedded in your minds, and will influence you in your careers, I can feel that I have accomplished something for my fellow-engineers. I wish you success in the vocation you have decided to follow, and sincerely hope that all of you may arise to prominence in your calling—the profession which boasts such notable names as those of Trautwine, Latrobe, Bollman, Roebling, and others too numerous to mention.

You may receive, perhaps, no earthly reward for your professional labors; but should you live morally and professionally the proper sort of life, when your work is complete and the shadows of the sunset are closing around you, it will be a matter of sincere gratification to feel that your fellow-man will grasp your hand and say "Well done, thou good and faithful servant!"

SOME RECENT EXAMINATION PAPERS.

MECHANICS OF MATERIALS.

FOURTH YEAR CLASS—May 18, 1910.

1. A 15-inch Cambria I-beam weighing 50 lbs. per foot, is loaded as shown in Fig. 1. Draw the shear diagram. Linear scale, $\frac{1}{8}$ inch = 1 foot and load scale, $\frac{1}{50}$ inch = 100 lbs. What is the maximum value of the shear and where does it occur? Where is the dangerous section and what is the value of the bending moment at that section? Is the beam safe? Why?

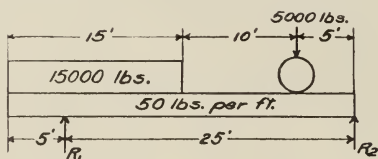


Fig. 1

2. Find the moment of inertia and radius of gyration of a trapezoid about the smaller base.
3. A wooden cantilever, 6 feet long, is required to support a load of 1,000 lbs. at a point 5 feet from the wall. Find the width if the the depth is to be 12 inches and the maximum fibre stress is not to exceed 1,000 lbs. per square inch.
4. What safe load may be carried by a 24-inch Cambria I-beam weighing 100 lbs. per foot and 20 feet long when used in a building as a column with square ends?
5. Determine the diameter of a round steel bar subjected to a twisting moment of 1,000,000 lbs. ins. The maximum fibre stress should not exceed 10,000 lbs. per square inch.

6. Find the value of the deflection y at a point distant x from the wall of a cantilever loaded with W lbs. uniformly distributed (see Fig. 2) then show that its resilience is equal to

$$\frac{S^2}{2E} \cdot \frac{1}{5} \cdot \frac{k^2}{c^2} \cdot AL$$

$$\frac{S^2}{2E} \cdot \frac{1}{5} \cdot \frac{k^2}{c^2} \cdot AL$$

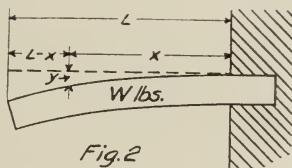


Fig. 2

Continued May 20, 1910.

(GRAPHIC STATICS.)

7. A beam is loaded as shown in Fig. 3. Disregarding the weight of the beam, construct the bending moment and shear diagrams for the loads shown. Find by measurement the maximum values of the bending moment and the shear and the point at which each occurs. Also find the point of inflection. Linear scale, $\frac{1}{8}$ inch = 1 foot; load scale, $\frac{1}{50}$ inch = 100 lbs.; polar distance, 1 inch. Determine bending moment scale. (Consider the distributed load by assuming it concentrated at 6 equidistant points.)

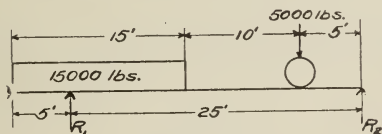


Fig. 3

8. A beam, 22 feet long, supports a load of 1,000 lbs. at a point 6 feet from the left end and one of 1,200 lbs. at 5 feet from the right end. In addition, there is a uniformly distributed load of 100 lbs. per foot. Construct the shear and bending moment diagrams. Scales: linear, $\frac{3}{16}$ inch = 1 foot; load, 1 inch = 1,000 lbs.; bending moment, 1 inch = 8,000 lbs. ft.

9. The cantilever shown in Fig. 4 is loaded with 2,000 lbs. uniformly distributed along the top chord. Draw the reciprocal diagram to the

scale of 1 inch = 600 lbs. Tabulate the stresses and indicate their kind on the frame diagram. Find the total reactions at the wall. Linear scale, $\frac{1}{4}$ inch = 1 foot.

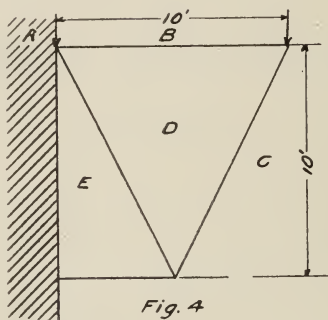


Fig. 4

10. For the crane shown in Fig. 5, calculate by the method of sections the magnitude and kind of stress in the members cut by the line xy .

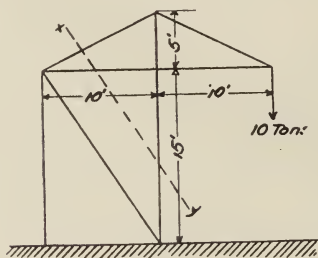


Fig. 5

11. The cambered roof truss shown in Fig. 6 is fixed at the left end and supported on rollers at the right end. The members BG,

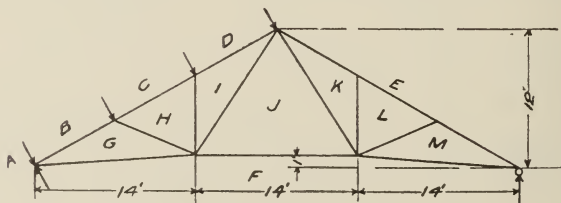


Fig. 6

CH, DI, EK, EL, EM, are all equal. The distance between principals is 15 feet. Draw the reciprocal diagram for the stresses produced

by the wind blowing upon the left-hand rafter with an intensity such as to produce a normal pressure of 25 lbs. per square foot of roof surface. Tabulate the value of the stresses and indicate their kind on the frame diagram. Scales: linear, $\frac{1}{8}$ inch = 1 foot; load, $\frac{1}{2}$ inch = 100 lbs.

STEAM AND INTERNAL COMBUSTION ENGINES.

FOURTH YEAR CLASS — May, 1909.

(Questions 1 to 9 inclusive for First Section; Questions 3 to 11 inclusive for Second Section.)

1. Show with the aid of sketches the operation of the four-stroke cycle.

2. Sketch and describe the Koerting suction producer plant.

3. Draw indicator cards showing the effect of governing by: (a) Delayed ignition; (b) premature ignition; (c) throttling the normal charge; (d) cutting off.

4. What principles were laid down by the inventor in the design of the Diesel engine? Sketch and describe the device for supplying fuel to the cylinder.

5. The following data were taken from a test of natural gas made with a Junker calorimeter: Amount of water, 0.3689 cu. ft.; differences in meter readings, 1 cu. ft.; temperature of room, 72.73° F.; temperature of inlet water, 53.42° ; temperature of outlet water, 94.3° ; temperature of gas at meter, 71.22° ; temperature of gas in chimney, 60.33° ; pressure of gas, 0.2 inch of water; barometer reading, 14.49 lbs. per sq. in. Find: (a) B. t. u. per cubic foot of gas at conditions of test; (b) B. t. u. per cubic foot of gas under standard conditions.

6. Sketch and describe a gasoline vaporizer.

7. Sketch and describe the Hornsby-Akroyd oil engine.

8. The following data were taken from a test of a Diesel engine using kerosene: Diameter of cylinder, 15.75 inches; stroke, 23.65 inches; r.p.m., 158.8; M. E. P. from diagram, 92.252 lbs. per sq. inch; B. t. u. per lb. of fuel, 18,610; fuel consumption per hour, 29.84 lbs.; length of Prony brake arm, 60 inches; pressure on scales, 460.4 lbs. Find: (a) I. H. P.; (b) B. H. P.; (c) mechanical efficiency; (d) thermal efficiency based on B. H. P.

9. Name four faults which produce in each case: Weak explosions; misfire; premature ignition. Name two faults which cause smoky exhaust.

10. A 16"x20" engine uses steam at 120.3 lbs. gauge pressure. Back pressure, 3 lbs. absolute; r.p.m., 165; cut-off, 0.25 stroke; clearance, 4%; dryness fraction of the steam, 0.98; thermal value of the fuel, 14,300 B. t. u.; temperature of the steam, 350° ; temperature of feed water, 132° ; boiler efficiency, 70%. The specific volume of the working steam is 3.329 cubic feet. Using a mean pressure factor of 0.9, find: (a) Pounds of steam per I. H. P. per hour; (b) pounds of water evaporated per pound of coal; (c) pounds of coal per I. H. P. per hour.

11. Show that the weight of the reciprocating parts of a simple duplex engine is greater than that of a compound engine of the same power, the two types having in common: Initial steam pressure, 115 lbs. absolute; exhaust pressure, 2 lbs. absolute; ratio of expansion, 8. For the compound engine the receiver pressure is 28 lbs. absolute, and the ratio of the cylinders is 4.

MECHANICS.

FOURTH YEAR CLASS — January, 1910.

1. A body starts from rest and moves with a constant acceleration. If it passes over 35 ft. during the fourth second from rest, what is its acceleration?

2. Part of a machine is moving southeast at 10 feet per second and after one-half second it is moving east at 4 feet per second. What is the amount and direction of the average acceleration during the one-half second? If the mass of the part is one ton, what was the magnitude of the average force acting on it?

3. A 20-ton car accelerates from 10 to 20 miles an hour in 15 seconds down an incline of 1 in 100 against a uniform frictional resistance of 25 lbs. per ton. The motors exert a uniform tractive effort during the 15 seconds. Find: The accelerating force; the uniform pull of the motors; the horsepower developed by the motors at the beginning of the period; the space passed through.

4. With the same conditions as given in problem 3, find the increase in kinetic energy and the decrease in potential energy of the car, the work done in overcoming the frictional resistance, and the work done by the motors. Write the equation of energy containing these four quantities.

5. A 20-ton car is rounding a curve of 1,000 feet radius at 40 miles per hour. What is the magnitude and direction of its acceleration? How large a force is necessary to give the car this acceleration?

6. A 10-lb. weight is prevented from sliding down a rough inclined plane by a horizontal force of 5 pounds. If the inclination of the plane is 30° , what is the value of the coefficient of friction called into play?

7. A crane has a vertical post 9 feet high and a boom 18 feet long weighing 0.5 ton. The angle between the boom and post is 45° and a weight of 5 tons is suspended from the end of the boom. Find the tension of the tie joining the end of the boom and the top of the post, and the magnitude and direction of the thrust on the lower end of the boom.

8. Find by construction and by calculation the distance from the bottom edge to the centre of gravity of an unequally flanged beam section of the following dimensions: Top flange, 3 inches wide and 1.5 inches thick; bottom flange, 15 inches wide and 1.75 inches thick; web, 1.5 inches thick; total height, 18 inches.

9. Determine the width of single-ply leather belting required to transmit 40 H. P. from a pulley 4 feet in diameter making 375 r.p.m. Assume: Arc of contact, 172.4° ; coefficient of friction, 0.3; density of leather, 0.036 lbs. per cubic inch; thickness of belt, $7/32$ inch; working stress, 66 pounds per inch width of belt. Take into consideration centrifugal force and the thickness of the belt.

MECHANICAL LABORATORY PRACTICE.

FOURTH YEAR CLASS — May, 1909.

1. In what two ways does carbon combine with iron to form cast iron. How are cast irons graded? What is the effect of manganese on cast iron?

2. Describe the process of making crucible steel; bessemer steel; open hearth steel. What is semi-steel?

3. Name the type of governor on the high-speed engine in the laboratory and describe its action. How may the steam consumption of an engine be found other than by the indicator?

4. Explain fully with the aid of a sketch how to find the indicated steam consumption of a compound engine from the high pressure cylinder diagram.

5. Describe the throttling calorimeter and give the theory of its action. How would very wet steam be indicated? How would superheated steam be shown and how may the number of degrees of superheat be found?

DIFFERENTIAL CALCULUS.

FOURTH YEAR CLASS—JUNE, 1909.

1. Define increment and derivative. Illustrate by finding the derivative of the function $y = \sqrt{a^2 - x^2}$.

2. Find $\frac{dy}{dx}$ when $x = a \log \frac{y + \sqrt{y^2 + a^2}}{\sqrt{a}}$.

3. What is the area of an equilateral triangle at the moment its side is increasing at the rate of 10 feet per minute and its area at the rate of 10 square feet per second?

4. Find $\frac{dy}{dx}$ from $y = (x^2 + 1) \sqrt{x^3 - x}$.

5. Find $\frac{dy}{d\theta}$ from $y = \log \frac{\sin \frac{1}{2} (\theta - a)}{\sin \frac{1}{2} (\theta + a)}$.

6. Find $\frac{d^3y}{dx^3}$ from $y = (\sin x - \cos x)xe^x + 3e^x \cos x$.

7. Determine the limiting value of $\frac{\log(x^2 - 4x + 5)}{\log \cos(x - 2)}$ when $x = 2$.

8. Find the tangent of 44° , using Taylor's Theorem.

9. A weight of 1,000 pounds hanging two feet from the fulcrum end of a lever is to be raised by an upward force at the other end. Supposing the lever to weigh 10 pounds per foot, find its length that the force may be a minimum.

10. Find the equations of the two tangents to the circle $x^2 + y^2 - 3y = 14$, parallel to the line $7y = 4x + 6$.

11. Change the independent variable from x to z in the following:

$$\frac{d^2y}{dx^2} + \frac{1}{x} \frac{dy}{dx} + y = 0, \text{ when } x^2 = 4z.$$

Omit any one except 4 or 9.

INTEGRAL CALCULUS.

FOURTH YEAR CLASS — MAY, 1909.

1. Find the equations of the asymptotes of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$.

2. If the co-ordinates of the centre of curvature of the equilateral hyperbola $2xy = a^2$ have the relations $A + B = \frac{(y+x)^3}{a^2}$ and $A - B = \frac{(y-x)^3}{a^2}$, prove that the equation of the evolute is $(A+B)^{2/3} - (A-B)^{2/3} = 2a^{2/3}$.

3. $\int \frac{x+3}{\sqrt{x^2+4}} dx = ?$

4. The slope of the tangent to a curve at any point is $-\frac{4x}{9y}$, and the curve passes through the point (3, 2). Find the equation.

5. $\int \frac{xdx}{(x+1)(x+3)(x+5)} = ?$

6. $\int \frac{dx}{x + \sqrt{2x-1}} = ?$

7. $\int \frac{\tan^7 x + 1}{\tan x + 1} dx = ?$

8. $\int x^2 \tan^{-1} x dx = ?$

9. Find the entire area of the curve $p^2 = a^2 \cos 2\theta$. Plot the curve.

10. Find the volume generated by turning about the X-axis the portions of the curve $x^2 - 3x + 2y = 0$ which is above the X-axis.

TRIGONOMETRY.

SECOND YEAR CLASS — June, 1909.

1. (a) On the circumference of a circle of 50 feet radius an arc of 10 feet is laid off. How many degrees in the angle at the centre subtended by this arc? (b) Given $\cos 2A = \sin A$, find the number of degrees in the angle A .
2. Find the value of the six functions of 60° .
3. Given $\tan A = 3$, find the other functions of the angle A .
4. Solve the equation $\sin^2 x - \cos x = -\frac{1}{4}$.
5. From a tower 58 feet high the angles of depression of two objects situated in the same horizontal line with the base of the tower, and on the same side, are $30^\circ 13' 18''$ and $45^\circ 46' 14''$. Find the distance between these objects.

ANALYTIC GEOMETRY.

THIRD YEAR CLASS — June, 1909.

1. Find the equation of the ellipse, having given the foci and the constant sum $2a$.
2. The equation of an ellipse is $25x^2 + 81y^2 = 450x$ when referred to rectangular axes. Find the major and minor axes and the co-ordinates of the centre.
3. Tangents are drawn from $(3, 2)$ to the ellipse $x^2 + 4y^2 = 4$. Find the equation of the chord of contact, and of the line that joins $(3, 2)$ to the mid-point of the chord.
4. Find the equations of the tangent and the normal to the hyperbola at the point (x_1, y_1) on the curve.
5. Write the equation of the hyperbola conjugate to $9x^2 - 16y^2 = 144$, and find its axes, distance between its foci, and its latus rectum.
6. Find the length of the semi-diameter conjugate to the diameter $y = 3x$ in the hyperbola $9x^2 - 4y^2 = 36$.
7. Define the Conchoid of Nicomedes. Develop its equation and discuss it.
8. Plot the curve whose equation is $r = a(1 - \cos \theta)$.

SURVEYING.

THIRD YEAR CLASS — June 12, 1908.

1. Show, by drawing, a vernier reading 7.563.
2. From the following field notes, plot the field and calculate its area :

1. N. $73^{\circ} 30'$ W. 5.00 chains.
2. S. $16^{\circ} 30'$ W. 5.00 chains.
3. N. $28^{\circ} 30'$ W. 7.07 chains.
4. N. $20^{\circ} 00'$ E. 11.18 chains.
5. S. $43^{\circ} 30'$ E. 5.00 chains.
6. S. $13^{\circ} 30'$ E. 10.00 chains.

3. In the triangle ABC, $AB = 12$ chains, $AC = 10$ chains, and $BC = 8$ chains; part off a trapezoid of 1 acre 96 perches by the line DE parallel to AB.

4. Write the proper numbers in the third and fifth columns in this scheme, make a profile of the section, and determine the gradient per station :

Station	+ S	H. I.	—S	H. S.	Remarks
0	6.944		7.4		Bench on post 22 feet north of 0.
1			3.9		
2			5.6		
3			4.6		
t. p.	3.855		5.513		
4			4.9		
5			2.5		
6			1.2		

ALGEBRA.

SECOND YEAR CLASS — June, 1909.

1. In how many different ways can \$1.65 be paid in quarter dollars and dimes?

2. Expand $\frac{1}{(a - 2b^2)}$ to four terms by the Binomial Theorem and simplify the result.

3. Write the sixth term of $(27x^3 - 8y^3)^{\frac{2}{3}}$.

4. Find l and n in the arithmetical progression in which $a = 7$, $d = 2$, and $S = 1927$.

5. The sum of three terms in geometric progression is 63 and the third is 45 greater than the first. What are the terms?

6. Find by logarithms the value of $\frac{4.5921 \sqrt[3]{0.021946}}{(0.41587)^3}$.

7. Solve $0.98765^x = 2.47$.

8. Find the diameter of a spherical shell whose thickness is 2 inches, and whose weight is $\frac{19}{27}$ of what it would be if it were solid.

GEOMETRY.

SECOND YEAR CLASS — June, 1909.

1. Prove that the volume of a triangular pyramid is equal to one-third of the product of its base by its altitude.

2. Prove that the volume of two triangular pyramids, having a trihedral angle of the one equal to a trihedral angle of the other, are to each other as the products of the three edges of these trihedral angles.

3. Prove that every section of a circular cone made by a plane parallel to the base is a circle.

4. Find the diameter of a given material sphere.

5. Find the radius of a circle determined by a plane one inch from the centre of a sphere 5 inches in diameter.

ELECTRICITY.**FOURTH YEAR CLASS — January 27, 1911.**

1. A shunt motor, connected to 110-volt supply mains, takes 2.4 amperes through the field coils and 2.5 amperes through the armature when running with no load. The resistance of the armature is 0.15 ohm, including brushes and contacts. What will be the efficiency of the motor when the armature current is 40 amperes? What will be the horsepower required to drive this generator when supplying the above current?

2. What electromotive force will be produced by a 6-pole generator, lap wound, with 338 conductors on the armature, the speed of the armature being 900 revolutions per minute, and the flux per magnet pole 1,600,000 lines? If the armature resistance were 0.09 ohm, what electromotive force would be delivered at the brushes with an armature current of 60 amperes?

3. Make a diagram for two compound generators in parallel, showing the equalizer. Make a diagram of a starting box, with low-voltage release, for a shunt motor, showing line wires and motor armature and field.

4. Give the winding scheme for a 4-pole, simplex, lap-wound armature, the back pitch being 31. Illustrate the difference between a duplex winding and a doubly re-entrant winding by making diagrams of a duplex, singly re-entrant winding and a duplex, double re-entrant winding, carefully numbering the commutator segments.

5. A three-wire system, 600 feet in length, supplies 800 lamps (0.5 ampere per lamp), at 110 volts, the voltage at the generator being 223. Considering the system as balanced and the lamps as concentrated at the end of the line, calculate the sizes, B. & S. gauge, for the mains and the neutral wire, considering the neutral as one-half the sectional area of the outside main. What voltage would each group of lamps receive if 500 lamps were on one side and 300 lamps on the other? Calculate to tenths of a volt.

6. What is the explanation of the high efficiency of the tungsten lamp? Describe the essentials of the Nernst lamp. Discuss the carbon arc lamp.

ELECTRICITY.**FOURTH YEAR CLASS — May 31, 1911.**

1. Name the different systems used for the operation of electric railways. Make a diagram of the single-phase controller, showing the connections of the transformer. Show how the controller may be used on direct current.

2. A single-phase alternator has 32 poles and makes 94 revolutions per minute. The stationary armature is made up of 32 coils of 18 turns each, and the magnetic flux from each pole piece is 5,000,000 lines. What electromotive force will the machine supply?

3. A three-phase generator, whose capacity when star-connected is 85 amperes at 13,200 volts, is altered to a delta connection. What should be the new rating of the machine as to volts, amperes and kilowatts?

4. (a) How is the potential output of a rotary converter regulated? (b) What two methods are used for determining at the power station the voltages at the distribution centers? (c) State what voltages are used for high-tension transmission, placing those which are supplied from generators in one column and those which are stepped-up in another.

5. (a) What is meant by the term slip as applied to the induction motor? (b) briefly describe the action of a frequency changer. (c) Distinguish between the motor generator and the rotary converter.

CHEMISTRY.

FOURTH YEAR CLASS — January 31, 1911.

1. Prepare a tabulated statement showing the occurrence in nature, method of preparation, principal compounds, and chemical and physical properties of the following: Sodium, potassium, calcium and magnesium.

2. How are gold and silver separated from their ores?

3. Give details for the preparation of the following: Ethyl alcohol, acetic acid, and sugar.

4. What precaution should be taken in an analysis for potassium? Why is it necessary to boil a substance with Na_2CO_3 before testing for most of the acids?

5. In what order are solvents applied to a powder? What substance is insoluble in all acids? Give a method for preparing a solution of this substance.

6. Write a complete set of equations expressing the reactions for the analysis of any three of the following compounds: NH_4Cl , PbCO_3 , $\text{Ba}(\text{NO}_3)_2$, FeS , KBr , MgSO_4 .

CHEMISTRY.

FOURTH YEAR CLASS — May 29, 1911.

1. State how complete titration is recognized in the following determinations: Ammonia, iron, manganese, mercury, phosphorus, silver, sulphuric acid.

2. Tabulate the principal stages in making a determination of carbon in steel by the method of combustion, and name the reagents used for each absorption.

3. What per cent. of iron is indicated in an ore which, to oxidize the iron in 12.4 grams of a sample, requires 400 cc. of a standard solution of potassium permanganate containing 1.41 grams to the liter?

4. A sample of illuminating gas shows, on analysis, the following composition: Carbon dioxide, 3.6%; illuminants, 7.2%; oxygen, 0.8%; carbon monoxide, 19.8%. 13.4 cc. of the gas were admitted to the burette and mixed with air to make the volume 99.2 cc. After explosion the first contraction was 20.6 cc. and the second contraction, 6.6 cc. Complete the report of the analysis, giving a summary of the results.

5. A sample of natural gas contains: Marsh gas (CH_4), 61%; hydrogen (H_2), 29%; ethane (C_2H_6), 8%; olefiant gas (C_2H_4), 1%; oxygen (O_2), 0.6%; carbon monoxide (CO), 0.4%. Required the relative volume of air necessary to burn it and the products of combustion. Tabulate results.

6. A Bessemer converter contains 10 metric tons of pig iron of the following composition: Carbon, 3%; manganese, 0.5%; silicon, 1.5%; iron, 95%. On being blown, one-third of the carbon burns to CO_2 and the rest to CO ; 5% of the iron is oxidized, and no free oxygen escapes from the converter. The blast is assumed to be dry. What weight of oxygen is needed during the blow? How many cubic meters of air at standard conditions will be needed? What will be the average composition of the gas produced?

ENGLISH.

THIRD YEAR CLASS — June 10, 1909.

Write on five of these subjects, viz.: 2; 4; 7; 1 or 3; and 5 or 6.

1. Milton's Puritanism.
2. What "Comus" is.
3. Some characteristics of Milton's style.
4. The essentials of a good argument.
5. A summary of Burke's objections to Lord North's bill.
6. The Polytechnic should close at noon on Wednesdays and Saturdays, instead of all day on Saturdays.
7. The formation of the English Language.

ENGLISH.

SECOND YEAR CLASS — June 8, 1909.

1. Give, in the form of a connected theme, the following information about the "Spectator": (a) its origin; (b) its contributors; (c) its character; (d) its purpose.
2. Discuss the stories that make up "The Merchant of Venice," explaining how they are worked into each other to make one story.
3. Write on the following subjects:
 - (a) Shylock was more sinned against than sinning. (Take the affirmative or negative, construct a brief, and write the argument.)
 - (b) The place of Act V in "The Merchant of Venice."
 - (c) One of the following: (1) My visits to Buffalo Bill's show. (2) An exciting baseball game. (3) My plans for the summer. (4) Along the water front of Baltimore. (5) My holiday.
 - (d) One of the following: (1) Sir Roger's visit to the Polytechnic Institute; (2) Sir Roger's butler in Lexington Market; (3) the "Spectator" at Oriole Park.
4. Name the different types of discourse, state the purpose of each, and mention at least two of the most important rhetorical principles that apply to each.

DEPARTMENT OF HISTORY AND CIVICS.

FINAL EXAMINATION IN AMERICAN HISTORY AND CIVICS.

Second Year Class, June 3, 1912.

INSTRUCTIONS.—(1) Read the entire paper through before beginning to write. (2) Number and letter the questions and parts of questions so as to correspond exactly to those on this sheet. (3) Be sure to answer only the required number of parts in each group; excess answers will not be counted. (4) Legible writing and clear English will improve your rating.

I. ANSWER TWO PARTS.

1. State the time, manner, and circumstances under which each of the following territorial additions was made: (a) Louisiana; (b) Florida; (c) Texas; (d) California; (e) Oregon; (f) Alaska.

2. Mention: (a) three inventions that prompted the rapid settlement and development of the West between 1800 and 1860; and (b) several reasons why so many people went West during this period.

3. Explain clearly the influence of the Westward movement on: (a) immigration; (b) industrial development; (c) national feeling; (d) democracy; (e) the slavery question.

II. ANSWER PARTS 4 OR 5 AND 6 OR 7.

4. Make a four-column table showing: (a) the principal slavery questions in dispute in 1848-1850; (b) the contention or desire of the North and of the South regarding each; and (c) the settlement effected in the Compromise Acts adopted in 1850.

5. Trace the steps by which slavery was abolished between 1861-1865: (a) in the seceding states; (b) in the loyal slave states; (c) in the territories and the District of Columbia; and (d) throughout the United States and its possessions.

6. Discuss the Constitutional authority of Congress to deal with slavery.

7. Explain clearly why slavery became a subject of sectional difference.

III. ANSWER TWO PARTS.

8. Explain the meaning of the following: (a) direct primaries; (b) the initiative and referendum; (c) the recall of elected officials; (d) city government by commission.

9. Give an account of: (a) the Australian ballot and the reasons for its introduction; (b) the purpose and usual provisions of a corrupt practices act; (c) composition and work of a national party convention.

10. Give an account of: (a) the party reorganization between 1820-1840; (b) the party reorganization between 1854-1860. In each case explain the causes of the change, the opinions and leaders of the re-organized parties.

IV. ANSWER TWO PARTS.

11. Mention five powers and duties of the president of the United States, and refer to historical examples of the exercise of each.

12. Mention four statutes that have been passed by Congress that were based on implied powers, referring in each case to the section of the Constitution that implies the power.

13. Give an account of: (a) the method which has so far been followed in adopting amendments to the Federal Constitution; (b) the three amendments adopted as a result of the Civil War.

14. Give short accounts of: (a) the organization of the Federal judiciary under the Act of 1911; (b) three important decisions of the Supreme Court.

V. ANSWER TWO PARTS.

15. Explain briefly the meaning of the following terms: (a) gerrymander; (b) carpetbagger, and scalawag; (c) Ku-Klux Klan; (d) habeas corpus; (e) spoils system and merit system; (f) reconstruction.

16. Give a short account of the personality, public career, and influence of each of the following: (a) Andrew Jackson; (b) William Lloyd Garrison; (c) Horace Mann; (d) John C. Calhoun; (e) Jefferson Davis.

17. Give a short account of three controversies with foreign nations which the United States has settled by arbitration.

18. Write a short account of some of the chief features of social, intellectual, and humanitarian reform during the nineteenth century.

SPECIMEN ENTRANCE EXAMINATION PAPERS.

**Set for Pupils Other Than Those Promoted From
the Grammar Schools.**

SPELLING AND PENMANSHIP

Writing from dictation a paragraph or two of some standard text—Irving's Rip Van Winkle or Bancroft's United States History.

GRAMMAR

- I.—Use each part of speech in a different sentence, indicating the part of speech used in each sentence by underscoring and naming it.
- II.—Define and give an example of a simple sentence, of a complex sentence, and of a compound sentence.
- III.—Parse the italicized words in the following sentence: "By not heeding the *counsels* of our elders, *how* often do we *lose* *what* we should gain!"
- IV.—Analyze the following sentence: "If we send the sailors a message in time, they will help us when the savages attack us."
- V.—Write sentences illustrating the correct use of any perfect tense of each of the following verbs: sit, set, seat, lie, lay, write, go.
-

COMPOSITION

The subject set is a description of some well-known place or object, or an account of some historical event.

UNITED STATES HISTORY

- I. What country was each of the following explorers serving when he came to America, and what territory did he discover or explore: Columbus, De Soto, Drake, Cartier?

2. Locate the settlements of the French, the Spanish, the Dutch.
3. Give a brief account of the settlement of Maryland.
4. Give a brief account of the wars between the English and French, extending from 1689 to 1763. State causes and results.
5. (a) State several causes of the Revolutionary War. (b) Name four important battles of the Revolution, and give a brief account of each.
6. What were the "Articles of Confederation," and why, and by what, were they superseded?
7. What is meant by "The Missouri Compromise?"
8. Name the principal causes of the Civil War. Who commanded on each side at Gettysburg? Why was the battle of Gettysburg so important?
9. What reason did the United States assign for going to war with Spain in 1898? What territory did the United States acquire as a result of that war?

ARITHMETIC.

1. Divide 5.375 by 0.0125, obtaining the exact result.
2. Simplify $\frac{1 + 0.5}{1 - 0.5} \times \frac{0.05 \div 0.005}{0.005 \div 0.05} - \frac{0.4\frac{1}{2}}{0.22\frac{2}{5}}$
3. A merchant's sales on Monday amounted to \$385.84. His sales on Monday were $16\frac{2}{3}\%$ of 54% less than the amount of goods sold on Tuesday. What was the amount of Tuesday's sales?
4. A firm sold an engine for \$7,050, thereby losing 6% ; for what should it have been sold in order to gain 12% ?

ALGEBRA.

1. Factor the expressions: $a^2 + 6ax + 5x^2$, $n^{10} - 16n^5 - 80$, and $1 - 9x - 36x^2$.
2. Simplify $\left[(a^2 - x^2) \div \left(\frac{1}{x} - \frac{1}{a} \right) \right] - \left[(a^2 - x^2) \div \left(\frac{1}{x} + \frac{1}{a} \right) \right]$.
3. Given $\frac{2x+1}{5} - \frac{3y+2}{7} = 2y - x$, $\frac{3x-1}{4} + \frac{7y+2}{6} = 2x - y$, find the values of x and y .

CATALOGUE OF STUDENTS.

Students whose names are marked with an asterisk (*) received 85% or more of the possible multiple for the year.

MID-YEAR CLASS OF 1913 — 39 MEMBERS.

*Bacharach, Abram F.	Korff, Harry
Baldwin, Lawrence A.	Lasinsky, Benjamin
Bartholow, J. Carroll	Lenderking, L. T., Jr.
Boone, Carlyle E.	Lentz, Francis
Brodie, Leigh H.	Levine, Julius
Constam, Earl A.	Lucke, Frank
Danzig, Hyman G.	Milburn, Paul B.
Davis, E. Stanley	Moore, W. R., Jr.
Ehrhardt, C. Raymond	Morrison, Carroll F.
Elgert, Elmer J.	Pruett, Clifton
Garrett, Curtis L.	Pumphrey, Charles L.
Hampson, Edward A.	Reynolds, Elmer C.
Heiner, John N.	Shilling, Louis E.
Hess, Walter	Smith, Milton
Hopkins, James	Trautman, Bernard J.
Isaacs, Isidore	Unglaub, Spencer S.
Kaiser, E. E.	Walker, C. H.
*Kaspar, Laurence C.	Walker, William F., Jr.
Kellinger, William J.	Webb, Charles F.
	Wood, William E.

CLASS OF 1913 — 88 MEMBERS.

Abercrombie, William T.	Carlton, A. Clifford
Ashley, Lloyd W.	Carter, Frank H.
Barnes, R. Kenneth	Cesky, Frank A.
Baumont, C. Rawlings	Clayton, Edwin C.
Becker, Charles A.	Cohen, Solomon
Boyer, Milton J.	Collett, Harry A.
Bratt, William Wallace	Collins, Laurence E.

Davis, Parlett	Meushaw, W. T.
Day, Hugh Walter	Miller, Harry
Duvall, Elmer E., Jr.	Miller, L. W.
Earle, Clarence	Mueller, Edgar A.
Emich, H. Crawford	Osborn, William H.
Gephart, George F.	Panettiere, Vincent
Gilpatrick, Lawrence F.	Poloway, Isaac.
Goldberg, Benjamin	Preston, J. Owings
Goldberg, Harry A.	Pyle, O. B.
Graham, William McL.	Quinan, Allen J.
Graulung, Charles H.	Ramirez, Reinaldo
Greer, Robert Tyson	Reiner, Milton
Gross, Charles F.	Reinhardt, Frank G.
Gunts, Robert F.	Reinicker, Lawrence T.
Haderman, George K.	Rodgers, Henry P.
Hall, Spencer	Sarbacher, J. L.
Hamm, Otto H.	Schwartz, William F.
Harrison, Walter H.	Sebald, Leslie
Heapy, William	Seidel, John J.
Heckmer, Earl A.	Sheckells, Robert W.
Hesse, Clarence	*Simon, Walter
Hicks, Robert	Sinclair, Carroll T.
Hill, John B.	Sindler, Jacob
Hoffman, Irving H.	Tapscott, William A.
Houghton, Ira L.	Thomas, S. Leroy
Houghton, Stedman	Tretick, Isaac
Johnson, Elmer Y.	Tschudy, Ernest
Kelly, Kendrick	*Wacker, Hermann
Kuehle, William F.	Waldkoenig, George E.
Lang, George E.	Waller, James M. S.
Leineweber, William F.	Wherrett, W. Norman
Levin, Jacob	Wilhelm, W. H.
Levis, Alfred C.	Williams, Chrystal
McAllister, J. Wardale	*Williams, John A.
*McCabe, Arthur S.	Wroe, W. Clarke
Markley, Cyril	Yearley, Edwin C.
*Meyerhoff, Louis	Ziefle, Howard E.

MID-YEAR CLASS OF 1914—35 MEMBERS.

Alcarese, Alphonso	Burnsall, William G.
Armstrong, M. Albert	Disney, Leroy R.
Benfer, Wilbur E.	Elliott, George H.
Bien, Samuel John	Fleischman, Leonard

Fusselbaugh, Reardon	Peddicord, Kenneth L.
Harman, George D.	Poehlman, James E.
Hart, Robert M.	*Porter, R. Lee, Jr.
Heimiller, M. Maurice	Pyle, Milton A.
Hicks, E. Russell	*Reitz, Robert A.
Hiss, Charles A.	Robinson, Harry L.
Klitch, Alexander	Rudis, V. Vyant
McLaughlin, Harvey F.	Sarbacher, William H.
Machen, S. Raymond	Schloss, Benjamin
Matuscvitz, Edward	Spies, Arthur T.
Messersmith, Paul	Von Eiff, Herman A.
Mullikin, Cecil H.	*Weissing, Louis
Nunn, Edward H.	Wolman, Sidney N.
	Woodall, James H.

CLASS OF 1914—117 MEMBERS.

Aldridge, James H.	Duck, William E.
Anderson, Richard W.	Edel, Walter L.
*Awalt, Gloyd F.	Elliott, David, Jr.
Bangs, John R., Jr.	*Ewell, Frank O.
Barrett, Julian B.	*Fox, Charles
Benson, John O.	Freeman, Stanley P.
*Bishop, Gordon K.	Gompf, John W.
*Black, C. Warren	*Greenberg, Harry
*Bloomsburg, Ralph A.	Hamill, Frank J.
Bondy, Edward W.	Hardinge, Thomas H.
*Bristol, Charles E., Jr.	Harris, Robert T.
*Burns, Charles W.	Heinmiller, Howard
Buxton, Nelson	Heinmiller, Paul
Carmichael, George W.	Hennick, Donald C.
Childs, Walton B.	Hess, J. Elmer
Constam, Milton M.	Hoffman, Charles E.
*Coursey, George C.	Hoffman, H. Lee
*Crist, Frank	Hogan, Harold O.
Cromwell, Stanley S.	Hogg, John W.
*Cullom, Kenneth S.	Hoke, William B.
*Dempster, Ryland	*Howard, Stanley L.
Denhard, Leroy	Isaac, Frank R.
Derr, Brant S.	Jackson, W. Irvin
Dinsmore, Thomas M.	Jacobs, Joseph
Ditman, Rothwell	Joyce, Temple N.

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|------------------------|-----------------------|
| Keagle, Walter J. | *Silberstein, Eli |
| Kemp, Wilbur | *Sloman, Harold |
| Kelly, Paul B. | Smart, Landon |
| Klawans, Edward | Spencer, Raymond D. |
| Knabe, Karl L. | Steinwedel, Edwin A. |
| Knight, Clarence | Stokes, John A. |
| Kohner, Emanuel | Stoudenmire, Lawrence |
| *Krieger, Joseph E. | Strobel, Peyton B. |
| Krotee, Benjamin A. | Stromeyer, William F. |
| Lapetina, Peter | Summers, Lindner T. |
| Lawrence, William R. | Talbot, George C. |
| Leonhardt, Milton D. | *Talkin, Harry |
| Linhardt, Otto C. | Taylor, R. Corbin |
| *Linthicum, Maynard J. | Thayer, James S. |
| McGinnis, Joseph | Thiess, Ferdinand F. |
| Mealy, J. K. | Thomas, Charles B. |
| Merritt, J. Levering | Thompson, Charles L. |
| Milbourne, E. Russell | Tilman, Daniel W. |
| Milhiser, Robert | Tregoe, Benjamin |
| Morrison, Walter H. | *Trigg, Charles W. |
| *Mosher, William B. | Warner, Wallace |
| Nitzberg, Frank | *Ward, Henry Clay |
| Pfeifer, Raymond S. | Ward, Wilbur F., Jr. |
| Price, Augustus R. | Weant, Clarence H. |
| Rice, John Wade | Weeks, Walter E. |
| Rittase, Elmer H. | Welsh, Raymond M. |
| Robinson, Jenkins A. | Whitcomb, Kenneth F. |
| Schad, Theodore G. | Whiteman, Rogers C. |
| Schmidt, Henry R. | Willhide, Paul A. |
| Schobel, Charles O. | Wilson, Vance Vernon |
| Seippel, John H. | Wolf, Paul B. |
| Shew, Brent | Wrenn, J. Edwin |
| *Shilovitch, Nathan | *Young, E. Carl |
| | Zimmerman, Emmett H. |

MID-YEAR CLASS OF 1915 — 57 MEMBERS.

- | | |
|------------------|--------------------|
| Adams, Albert C. | Corner, Frank |
| Adams, Arthur J. | *Dempster, John S. |
| *Breyer, Ralph | Dischler, Gordon |
| Chism, Edward K. | Eliason, Henry C. |
| Collison, Vernon | Friend, Walter |

Gessford, Joseph, Jr.	Munroe, Everett
Gillespie, James M.	Neavitt, E. Hall
Green, Fred.	Necker, Louis
Greenwald, Sidney	Nengel, Theodore
Harrison, Horace B.	Panettiere, Cayetano
Haskell, Lee C.	Patzschke, William C.
Hedrick, Melvin	Price, Alan
Hoffman, George A.	Quick, Roland S.
Hollander, Louis J.	Renno, Arthur A.
Johnson, J. Marvin	Seidenman, Ellis
Kalling, Lewis J.	Shew, Harry F., Jr.
Kaufholz, Robert M.	Snyder, W. Overton, Jr.
Kellner, H. Irvin	Stewart, Robert J. B.
Koffenberger, Charles	Stewart, William L.
Leonhardt, Carl O.	Stumptner, A. G.
Lutz, James A.	Tearney, Joseph F.
McAuliffe, Cornelius	Trimble, James R.
McGinnis, Herbert	Turner, Wadsworth
Mallonee, Lloyd L.	Walter, Jasper
Manger, Charles E.	Weinberg, Samuel
Milby, Eugene W.	Whaley, W. Monroe
Moltz, Leonard C.	Williams, Jesse
Moore, William W.	Wright, Randolph K.
	Ziefle, H. Paul

CLASS OF 1915 — 234 MEMBERS.

Anderson, Gunnar W.	Blazek, Charles J.
Anger, Albert E.	Bloom, Abraham
Armiger, William J.	Bosworth, Russell D.
Aronson, Samuel	Bourne, Earl T.
*Ballard, Donald D.	Bowen, John W., Jr.
Bassett, Daniel M.	Braun, Christian
Bauernschmidt, R. L.	Brill, Charles N.
Beacham, Frederick B.	Brown, F. Lorin
Beetham, Curtis	Brown, Stewart
Benson, Carl	Brown, Thomas M.
Bentz, William L.	*Burgess, Harry J.
Berlin, Benjamin	Burner, Russell K.
Bishop, Russell G.	Caldwell, Lee R.
*Bitter, Kenneth O.	Callowhill, Harold S.
*Bittorf, Henry J.	Campbell, Lawrence O.
Blaustein, Herbert	Carroll, J. Earl

- Chatterly, Douglas
 *Chipman, Joseph
 Clisham, James
 Cole, Walter M.
 Collmus, R. Selway
 Constam, Henry
 Crandell, Raymond A.
 Crawford, William F.
 Currie, Kent D. D.
 Cushen, Harry P.
 Darley, Lea A.
 Davis, Allen V.
 *Denhard, Elbert E.
 Dennis, Percy D.
 Dietz, Harry H.
 Dinkelman, Carl M.
 Duncan, William W.
 Eisenbrandt, Fred.
 *Eisert, L. William
 *Elsnic, Frank
 Ensor, William L.
 *Erck, Charles F.
 *Esterson, Max
 Feldman, Walter H.
 Finkelstein, Isidore
 Freeman, Hyman G.
 Fredl, Edward F.
 Fusselbaugh, Robert, Jr.
 Gail, Emil J.
 Garrett, Roland
 Gier, Frank
 Gilpin, Levering
 Gittinger, Alexander B.
 Givner, Abraham
 *Glaser, Alfred W.
 Glick, Morris
 Goldman, Louis
 Goldstein, David
 Gompf, George
 Gore, William H.
 *Greenbaum, Isaac
 Gressitt, William G.
 Grieb, Christian
 Haile, Le Roy Y.
 *Hampsher, William L.
 Harden, William C., Jr.
 *Hardin, John R.
 Hardy, G. Edmund
 Hargreaves, Arthur C.
 Haskell, Crawford R.
 Hastings, Warren
 *Hauer, Harry E.
 Hauswald, Carl C.
 Hedian, Ralph V.
 *Heller, Morris S.
 Herr, Robert M.
 Heuisler, Harry
 Hipsley, Preston
 Hobbs, Elmer H.
 *Holden, Urban S.
 Hopkins, Walker
 Hollstein, Arthur W.
 Horlebein, Edwin W.
 Houck, Frank G.
 Houdeshel, Howard
 Huhn, Augustus, Jr.
 *Hunt, James
 Hunter, Herbert T.
 Jenkins, Leonard D.
 Jennings, Carey
 Johnson, Joseph G.
 Joyner, Norman
 Kaestner, Albert
 Kaiser, Charles A.
 Kaspar, Charles J.
 *Kemler, Thomas G.
 Kenny, Raymond
 Kirkley, Stanhope S.
 *Klemm, Gustav W.
 *Klunk, Frank
 Knecht, John
 Knoop, Fred.
 Korpman, Walter W.
 Krotee, Harry
 *Krug, William F., Jr.
 *Lampe, John H.
 Lang, Richard
 Lauten, William B.
 *Laux, G. August
 Lawrence, J. H.

- Lawrence, Wallace
 Lazenby, Joseph D.
 *Lehr, William E.
 Little, Francis W.
 Longley, Edward L.
 Lockett, P. Wilson
 McDonald, George
 McDonough, A. Wilford
 McGee, Earl M.
 McGinnis, Charles A.
 McLeod, David R.
 *McQuinn, Charles E.
 Maguire, John J.
 Mahler, George L., Jr.
 Mansfield, Richard L.
 Marks, Harold L.
 Martin, William
 Miller, Harold F.
 *Moeser, William
 Mohlenrich, Henry C.
 Moore, J. Duncan
 Moore, Robert
 Morrison, Herbert K.
 Murchison, David
 Naeny, Albert H.
 Neal, Roland W.
 New, Charles W., Jr.
 Novak, Frank
 O'Keefe, John J.
 Oliver, Harold D.
 *O'Neill, George E.
 Onion, J. H.
 Oppenheim, Maurice
 Ortman, Carl C.
 Ostheim, H. Seibert
 *Paige, Edward R.
 Parsons, Harry
 Peters, Stuart A.
 *Petrick, Edward
 *Pfaff, Rudolph
 Phillips, George T.
 Picker, Kumbert
 Pivarnick, Eli
 Poetter, William R.
 Powell, John
 Preston, Charles R.
 Prince, Henry L., Jr.
 Purdy, Egbert
 Rabl, Samuel
 *Rede, George R.
 Reimer, John
 Rhode, Russell M.
 Riepe, Harry U.
 *Robowski, Joseph, Jr.
 Rosenthal, Jacob S.
 Rowland, Henry A.
 *Sabsewitz, Benjamin S.
 Sanner, John W.
 Schmidt, Carl W.
 Seitz, Monroe
 Sellman, Lee W.
 *Seltzer, Eugene P.
 Sener, Beverley T.
 *Shanklin, Arthur P., Jr.
 *Shanklin, Richard G.
 *Sheely, Raymond
 Sheridan, Richard C.
 Sherlock, Carlton P.
 Sherwood, Irving
 Sieck, Claymore C.
 Sinclair, Preston S.
 Singewald, Paul H.
 Slasman, William H.
 *Smith, Charles G.
 Smith, Edward A.
 Smith, Raymond
 Smith, Robert F., Jr.
 Smith, William A., Jr.
 Spittel, Robert J.
 Startzman, Henry H.
 Strehlau, William F.
 Struven, Albert L.
 Thompson, Charles E.
 *Thompson, Lawrence
 Tilghman, Robert N.
 Tompkins, Edwin L.
 Townsend, Francis H.
 Townsend, Guy
 Tucker, Albert L.
 Turner, Robert G.

Von Schulz, William M.
 Vernay, Walter H.
 Wallace, Charles E.
 Warren, Wilson C.
 Waters, Murray G.
 Weaver, John E. R.
 Weigand, Philip
 Weil, Joseph
 Weinberger, John
 Wendel, Adam
 Wessels, Bernard T.

Wessels, Walter B.
 Wherley, Clarence V.
 White, Chester
 White, Herbert E.
 *Whitehill, Morton S.
 *Wiland, Luther
 Wilner, Samuel
 *Wolf, Herman
 Wright, Howard P.
 Young, Douglas F.
 Zenitz, Nelson

MID-YEAR CLASS OF 1916—87 MEMBERS.

Addison, Walter W.
 *Baer, Barkard F.
 Baxter, William C.
 Behrens, Carl A.
 Born, E. Otto
 Bramble, Arthur E.
 Brian, Carville
 Bull, Paul L.
 Burnham, Kenneth
 Chipchase, James B.
 Cohen, Samuel
 Cooling, Henry L.
 Compton, Key
 Crout, Marvin M.
 Damico, Vincent
 Davis, George W.
 Deal, Milton H.
 Dehler, Frank
 Dessel, George
 Diehl, Richard S.
 Dietrick, Elmer M.
 Downie, Donald S.
 Ellis, Newton R.
 Erck, Henry G.
 Feast, Harry C. L.
 Fields, William W.
 Franz, Rudolph
 Freeland, Willard I.
 Gemmill, Hamilton

*Greenspun, Joseph
 Greer, Bryan
 Greisz, Joseph O.
 Hardy, Harry C.
 Hasson, Leonard V.
 Hebbel, Emil E.
 Hebbel, Julius
 Hertel, Albert
 Hempel, William J. F.
 Hess, Leslie H.
 Hohman, Conrad
 Hook, Leroy J.
 Hubbard, William
 Iddings, Llewellyn L.
 *Keese, Maurice J.
 Kimmel, Lewis E.
 Koerber, Frederick
 Lau, John H.
 Lean, James T.
 Lutzky, Bernard
 McCallister, Samuel L.
 Miller, Harry A.
 Mills, William N.
 Moore, Fred. William
 Neubauer, John J.
 Nicols, John L.
 Noha, Charles M.
 O'Keefe, Irving
 O'Neill, Roland

Pawley, Howard
 *Pearson, William P.
 Poehlman, George I.
 Pryor, Robert L.
 Quarles, Giles W.
 Robinson, Christopher S.
 Roth, Louis H.
 Rudo, Zoorah
 Schimmel, Richard
 Shriner, Clarence E.
 Sinclair, Walter
 Skinner, Claude M.
 Slingluff, Lee H., Jr.
 Smith, Anthony
 Smith, James

Smith, Paul E.
 Snyder, Edwin A.
 Thomas, John R.
 Tillie, Karl F.
 Vogedes, William
 Walter, Charles
 Weil, Louis
 White, John G.
 Wiesner, Henry F.
 Wolf, DuPont
 Wood, Lukens
 Woodall, Robert E.
 Wooden, Dewey F.
 Wrightson, William H.

CLASS OF 1916 — 446 MEMBERS.

Abramowitz, Abram
 Albrecht, Clinton A.
 Albrecht, Vernon J.
 Aldrich, Edward
 Alvey, C. Walter
 Anderson, Charles D.
 Applestein, Frank
 Arnold, William S.
 Auld, Hugh
 Austin, William E.
 Baker, Bryant
 Baker, Eli
 Baker, Harold D.
 Barnette, K. Dudley
 Barsotti, Alphonsius
 Bauer, Charles M.
 Belbin, Alfred E.
 Berlin, Hyman
 Berlin, Max
 Bernstein, Benjamin
 Berry, Morris
 Best, Edward
 Betz, Norman J.
 Beutelspacher, W. S.
 Bevans, Bertie
 Beyer, Charles L.

Binns, Edwin V.
 Black, Frank E.
 Blackburn, S. C.
 Bleakley, W. Frank
 Bloomsburg, Harry E.
 Blum, Nathan S.
 Blunt, Samuel
 Bock, Carl F.
 Bohnlofink, Edward
 Bolte, John Kirk
 Bolton, Lee S.
 Bond, Stanley
 Bosley, Joseph R.
 Bourne, Thomas B.
 Bowen, James Gordon
 Broadbelt, John E., Jr.
 Brooks, E. Heath
 Brown, Edgar F.
 Brown, Edgar K.
 Bruggeman, Herman
 Buckley, Charles H.
 Bull, William
 Bunnecke, George H.
 Bunting, T. Wilbur
 Buppert, Eugene M.
 Burgess, William

- Burroughs, W. B.
Bye, H. Burton
Byrd, Robert M.
Calder, Albert K.
Callahan, Joseph
Campbell, P. Joseph
Cann, Bertram B.
Cardegna, Frank A.
Carmine, Campbell
Carney, James N.
Carpenter, Emory
Carr, Orlando A.
Cassard, Louis L.
Church, C. W.
Clark, William H.
Clark, DeKalb
Clifton, Ralph C.
Codd, William
Collins, Lewis, Jr.
Collins, William H.
Collison, John H.
Colton, Wilbur L.
Cook, William D.
Corse, Norris
Countess, J. E.
Cowan, David, Jr.
Cowan, William T.
Cox, Leroy
Cox, T. Newell
Criswell, Dewey
Crout, Paul G.
Culler, R. Lester
Davids, Bernard P.
Davis, Curtis F.
Davis, Earl
Davis, Emerson
Davis, W. Ewell
Deckelman, B. E.
Delaney, J. H.
Denison, Alfred
Denmead, Arthur
Denmead, Francis, Jr.
Diehlman, Allen
Diggs, Austin C.
Dixon, H. Gist
Doenges, Elmer U.
Dorsey, Arthur
Douglas, Roscoe Lane
Doyle, Bernard
Dreyer, Frederick
Driscoll, Russell C.
DuBreuil, Aristides
Duke, John B.
Eberly, Edward A., Jr.
Edwards, Wilbur
Eisel, George W.
Elliott, Irving M.
Elste, Albert
Ely, Harry
Emich, William L.
Erdman, Francis
Erdman, William R.
Fairbank, Ralph W.
Fait, George H.
Fallon, Donald W.
Faupel, Stanley H.
Fekl, Charles John
Field, Samuel S.
Finkelstein, Samuel
Fitz Patrick, Charles
Foreman, Carroll L.
Foster, Stanley
Fowler, Carville J.
Francis, Robert N.
Free, Champ
Freeman, Edward M.
Fulton, Franklin D.
Furst, Harold
Garbus, Louis
Garrett, Wilmer F.
Gatch, Thomas
Geiss, John H.
Gerding, Raymond H.
German, Rodman
Gettier, Raymond
Gleason, James K.
Gochnauer, Charles B.
Goeb, C. Herbert
Goldsmith, Max
Goodman, Reuben

Gorsuch, George R.	James, John A.
Grasnuck, George W.	Janushek, Joseph C.
Greenfeld, David	Jarvis, Carryl H.
Gregory, Mark	Jasper, Felix
Griffith, Joseph	Jeskulski, J. J.
Grubbs, Richard H.	Joesting, August H.
Gummer, Edward G.	Johnson, Edward
Gummer, Gordon F.	Johnson, Louis
Haensler, Oscar R.	Jones, Harry
Hall, Harry U.	Jones, John M.
Hall, R. Irving	Jones, William H.
Hall, Robert C.	Kairys, Harry
Hall, Robert S.	Kaufman, Solomon
Hambleton, Richard W.	Kelbaugh, William S.
Hampson, G.	Kellner, Raymond C.
Hasenkamp, Edgar	Kemler, James F.
Hayden, Page	Kerr, James Wilson
Hecklinger, Guy E.	Kidd, William
Heinz, Clinton E.	Kilmer, Horace D.
Heinze, William T.	King, C. Norwood
Heming, William L.	Kirk, Leroy A.
Henze, Charles W.	Klank, Ellis B.
Herzog, Leroy	Klimm, Leroy W.
Himes, William B.	Knecht, A. H.
Hindes, H. C., Jr.	Knecht, Vernon L.
Hinds, William S., Jr.	Knipp, Howard F.
Hoffman, E. L.	Koch, H. H.
Hohman, Allen C.	Kraft, George
Holmes, Richmond B.	Kratz, Herman
Honig, Albert	Krebs, Charles F.
Houghton, Ralph E.	Krengel, Edgar R.
Houghton, R. T.	Kueberth, Harry J.
Hubbard, Thomas F.	Labai, Adam J.
Hueg, Otto	Lamb, Roland H.
Hughes, Milton	Lasinski, Frank T.
Hull, Arthur	Lastowski, Alexander
Hull, Cyrus W.	Laughlin, James Earl
Hunt, John J.	Lauterbach, Edgar W.
Hupfeldt, Herbert	Lazarus, Nathan
Hurley, Edward Lee	Lazenby, Marion
Husted, Mortimer	LeCompte, Douglas
Hyle, Walter D.	Lemke, Edward
Ingham, W. Chesney	Lentz, Valentine
Jackson, Arthur L.	Leutbecker, Walter S.
Jacoby, Clair	Levy, Abraham

Lipp, William M.	Myers, John Milton
Lipschutz, Louis	Neal, Oliver
Littleton, Oliver W.	Newmann, Brunno T.
Loetell, Albert W.	Nichola, C. Stirling
Loewenstein, Frederick	Nicholson, Calvin B.
Lyons, Gerald J., Jr.	Norris, John Victor
McClure, Clayton E.	Norwood, John E.
McComas, J. Roland	Nutter, Francis W.
McCracken, Willard	Orne, Stephen
McCullough, Enoch S.	Osborn, Carter G., Jr.
McDairmant, John	Oshrim, Max
McDonough, Clarence O.	Parsons, Albert L.
McDonnell, Francis J.	Passano, Leonard
McGarvey, Julian A.	Pate, Charles L.
McGinnis, Stuart	Patzschke, James M.
McKellip, Spencer W.	Paulus, G. Irving
McShane, Ralph E.	Payne, Ralph C.
Machen, Joseph E.	Peoples, Grant
Maconachy, Read C.	Pertsch, Charles
Mahoney, Wesley J.	Pessagno, James
Mahool, John B.	Petre, Preston
Maguire, Joseph B., Jr.	Pierce, Warren F.
Malambre, Guy	Pillsbury, Harold
Manfuso, J. Guy	Pitt, William R., Jr.
Martenet, St. Clair	Plaskitt, James M.
Meikle, J. Donald	Plassing, Edwin
Meissel, Howard A.	Platt, Louis
Merriken, William	Pleet, Maurice
Metzman, Karl	Pohl, Walter F.
Michael, Carl	Pohmer, Albert
Miller, Charles H.	Polucki, Paul
Miller, Hugh	Poster, Aaron
Miller, Joseph	Poteet, Powell
Mirvis, Jacob	Rasch, George C.
Mohlhenrich, R.	Rasch, William H.
Moore, Charles W.	Ratcliffe, Eulon
Moore, Frank G.	Rathell, Vernon Leroy
Morstein, Harry	Rauschenbach, Charles E.
Mueller, George R.	Ray, L. C.
Muir, J. Allison, Jr.	Rehmeyer, R.
Mullan, Evans	Reier, Paul G.
Mullan, Herbert	Reilly, Donald
Muller, William Edwin	Reilly, J. E.
Muller, William R.	Reindollar, Edward
Murray, Edwin E.	Reisenweber, Henry

Reynolds, Leroy C.
Ricaud, James M.
Rice, Emory
Rice, Frank
Richardson, John
Richmond, Sidney L.
Ricker, Albert
Ridgaway, Norris
Riley, Jesse
Rinn, Henry F.
Ritter, Paul A.
Roberts, Arthur W.
Robertson, Frank B.
Robinson, Augustus O., Jr.
Roche, Clinton B.
Rocklin, Harris
Roebuck, T. Harris
Roeder, Charles B.
Rose, Myron
Rosenblatt, Samuel
Rosenfeld, Benjamin
Roskes, David
Rouchard, Edward F.
Rowles, Walter B. S.
Ruckle, Arthur
Rudolph, Clinton H.
Ruhl, Carl C.
Salter, Ernest H.
Saunders, D. S.
Schaffer, Chester D.
Schapiro, Louis
Schiaffino, Aurelio
Schlosser, Louis E.
Schroedl, Walter T.
Schultz, Frederick W., Jr.
Schwanke, Herman A. B.
Schwartz, Charles H.
Sebald, Jack
Senner, Arthur H.
Sevel, Edward
Seidewitz, Albert
Shamburger, Joseph
Shpritz, Nathan
Shreve, Arthur L.
Shriver, Samuel S.

Shroyer, Maurice
Silberstein, Samuel
Sindler, Herman
Smetana, Joseph
Smith, Edward F.
Smith, George O.
Smith, L. Lee
Smith, Sewall
Smoot, Barton
Snyder, Leo K., Jr.
Sonneborn, D. B.
Spedden, John C.
Spilman, Robert E. Lee
Stastny, Rudolph
Stevens, William
Stewart, W. C.
Strasser, Edward F.
Stricker, Edward
Suter, Walter J.
Swartz, James M.
Swartz, Richard P.
Taylor, Arthur
Thaile, Herbert
Thayer, William C.
Theller, Sherwood D.
Thomas, B. F.
Thomas, Harry
Thomas, William E.
Thompson, A. Clarence
Thompson, Edward L., Jr.
Thompson, J. Clarence
Thorpe, Albert
Tilghman, R. Houghton
Tippett, F. Frank
Turner, Conner
Turner, Thomas W.
Tralinsky, Morris
Upton, William K.
Vickers, J. K.
Vogel, H. H.
Voltz, Fred. William J.
Waddell, William
Wagner, Herbert W.
Walker, Holcombe
Walker, Uttman

Walker, Wilton E.
Watkins, John Wilbur
Weatherby, Newton T.
Weaver, Francis P.
Webb, William
Weedon, Eugene
Weise, William A.
Weiskittel, Francis
Wells, Clifton K., Jr.
Westerfield, Benjamin
Wheedon, H. Ford
Wheeler, George J.
Wiegand, William
Williams, Carroll
Williams, John W.
Willis, Charles F.
Wilson, Raymond

Wilson, William J.
Winters, John E.
Woelper, Edmund F.
Wohlgemuth, Christian
Woolford, Charles M.
Worden, Lloyd G.
Worthington, Lester G.
Wright, J. Norman
Wright, Summer B.
Wroten, John
Young, Elmer
Young, John A.
Young, Nelson
Yourex, Lambert
Zapf, Paul A.
Zerhusen, Henry, Jr.
Zimmerman, Donald

MID-YEAR CLASS OF 1917 — 94 MEMBERS.

Adams, G. B.
Appel, C. S.
Armstrong, E.
Blaha, Charles S.
Blenkner, C. H.
Brasse, Charles W.
Brown, R. E.
Childs, G. Elwood
Colliflower, H. E.
Cover, H.
Crafton, J. B.
Crouse, William P.
Crow, E. A.
Cummins, J. E.
Day, John L.
Diamondstein, Saville
Dietrich, J.
Dolliver, A.
Dorsey, James K.
Dufur, Mallory W.
Earp, A.
Ehrlich, Roger U.

Eisenberg, Paul
Erdman, Charles Carroll
Everist, T.
Ewing, Leroy C.
Fairbanks, Charles W.
Ficht, Carl E.
Finley, J. N. G.
Fissel, Edwin J.
Gallagher, John B.
Gallagher, Joseph Gordon A.
Gordon, A.
Gorrell, P. R.
Green, Edward James
Greenbaum, L.
Grice, C. E. St. Elmo
Hax, E. Earl
Hentzschel, W.
Herring, Frank W.
Herrlich, G. L.
Hibbitts, T. J.
Hickey, L. T.
Himler, Luther P.

Holbrook, Robert
Hudgins, Eugene Vernon
Huff, Harvey
Hyman, G. W.
Kaufman, Frank August
Kern, W. W.
King, John Bailey
Lafferty, R. Earle
Lambdin, A.
Lang, Frederick J.
Letzkus, G. E.
Lewis, W. Mansell
Litzinger, J.
Ludwig, Albert E.
McCauley, N.
McComas, G. L.
McGuire, John
Meade, Arthur C.
Moeller, H.
Mole, R.
Morganstein, M.
Mullan, Vernon
Mund, Charles H.
Neiman, H.
Oler, Albert W.

Parks, Richard W.
Paulus, Albert Mathias
Plitt, George P.
Pohlman, J. V.
Pritchard, Ross E.
Reynolds, Milton L.
Roberts, C. W.
Roypen, M.
Santos, Alexander
Schad, Charles I.
Schueler, J. R.
Sears, Ralph R.
Shriner, N.
Sibley, Leon T.
Sutton, Howard I.
Thiess, C. H.
Tumbler, Joseph
Viessman, W.
Walker, Stanley B.
Wanicek, John
Watson, Arthur G.
Weiskittle, Herbert
Wells, R. N.
Ziegler, Fred.
Ziegler, H. B.

SUMMARY OF ENROLLMENT.

Mid-Year Class of 1913.....	39
Class of 1913, A Class.....	88
Mid-Year Class of 1914, A-x Class.....	35
Class of 1914, B Class.....	117
Mid-Year Class of 1915, B-x Class.....	57
Class of 1915, C Class.....	234
Mid-Year Class of 1916, C-x Class.....	87
Class of 1916, D Class.....	446
Mid-Year Class of 1917, D-x Class.....	94
<hr/>	
Total enrollment.....	1,197

CLASS ORGANIZATIONS.

CLASS OF 1913—A CLASS.

<i>President</i>	Leslie Sebald.
<i>Vice-President</i>	Henry P. Rodgers.
<i>Secretary</i>	Oden B. Pyle, Jr.
<i>Treasurer</i>	Hugh W. Day.

MID-YEAR CLASS OF 1914—A-x CLASS.

<i>President</i>	Louis Weissing.
<i>Vice-President</i>	Reardon Fusselbaugh.
<i>Secretary</i>	Paul Messersmith.
<i>Treasurer</i>	Kenneth L. Peddicord.

CLASS OF 1914—B CLASS.

<i>President</i>	Joseph Jacobs.
<i>Vice-President</i>	J. Levering Merritt.
<i>Secretary</i>	F. Gloyd Awalt.
<i>Treasurer</i>	Clarence H. Weant.

MID-YEAR CLASS OF 1915—B-x CLASS.

<i>President</i>	James M. Gillespie.
<i>Vice-President</i>	Leonard C. Moltz.
<i>Secretary</i>	Ralph F. Breyer.
<i>Treasurer</i>	Randolph K. Wright.

CLASS OF 1915—C CLASS.

<i>President</i>	Arthur P. Shanklin.
<i>Vice-President</i>	Robert Fusselbaugh, Jr.
<i>Secretary</i>	Luther K. Wiland.
<i>Treasurer</i>	Albert L. Struven.

MID-YEAR CLASS OF 1916—C-X CLASS.

<i>President</i>	E. Otto Born.
<i>Vice-President</i>	Walter W. Addison.
<i>Secretary</i>	Albert Hertel.
<i>Treasurer</i>	John G. White.

CLASS OF 1916—D CLASS.

<i>President</i>	Orlando A. Carr.
<i>Vice-President</i>	D. S. Saunders.
<i>Secretary</i>	Edward Best.
<i>Treasurer</i>	Francis P. Weaver.

LITERARY SOCIETIES.

The "Lowell."

<i>President</i>	Abram F. Bacharach, Mid '13.
<i>Vice-President</i>	Albert Hampson, Mid '13.
<i>Recording Secretary</i>	Milton Reiner, '13.
<i>Corresponding Secretary</i>	Paul B. Milburn, Mid '13.
<i>Treasurer</i>	Vincent Panettiere, '13.
<i>Sergeant-at-Arms</i>	E. Stanley Davis, Mid '13.
<i>Reporter</i>	J. Nathaniel Heiner, Mid '13.
<i>Executive Committee</i>	<div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 2em; vertical-align: middle; margin-right: 5px;">{</div> <div> Walter Hess, Mid '13. Carroll F. Morrison, Mid '13. Abram F. Bacharach, Mid '13. </div> </div>
<i>Critic</i>	C. Lawrence Kaspar, Mid '13.

The "Poe."

<i>President</i>	Walter V. Harrison, '13.
<i>Vice-President</i>	W. Taylor Abercrombie, '13.
<i>Secretary</i>	Francis M. Lentz, Mid '13.

<i>Treasurer</i>	Louis E. Shilling, Mid '13.
<i>Reporter</i>	J. L. Merritt, '14.
<i>Historian</i>	G. W. Anderson, '15.
<i>Librarian</i>	Paul A. Willhide, '14.
<i>Sergeant-at-Arms</i>	John H. Seippel, '14.
<i>Critic</i>	Mr. William P. Stedman.
<i>Executive Committee</i>	{ J. D. Lazenby, '15. Gloyd F. Awalt, '14. Walter V. Harrison, '13.
<i>Business Committee</i>	{ R. Lee Porter, Jr., Mid '14. W. G. Bursnall, Mid '14. W. Taylor Abercrombie, '14.

The "Adelphia."

On October 18, 1912, the students of the first year at the Polytechnic met Mr. H. P. Porter, of the Department of English, for the purpose of organizing a third literary society of the Institute. After considering the possibilities, it was decided to draw up a constitution broad enough to admit to the proposed society, not only students of the first year, but any student of the school. The society was accordingly organized and called the Adelphia. At the close of the first term it had a membership of eighty-seven.

Besides conducting the regular work of the societies of the Polytechnic, the Adelphia has interested itself in proposed debates with other schools, and will undertake no slight share in the labor of preparing for the June Play and other Polytechnic activities.

In addition to the literary programs, prepared by members of the society, great interest has been created through a series of lectures delivered by prominent men of Baltimore and vicinity.

The officers of the Adelpia Literary Society are as follows:

<i>President</i>	A. B. Carr.
<i>Vice-President</i>	Otto Born.
<i>Recording Secretary</i>	W. A. Addison.
<i>Corresponding Secretary</i>	C. Robinson.
<i>Sergeant-at-Arms</i>	L. Iddings.
<i>Treasurer</i>	John H. Lau.
<i>Critic</i>	Mr. H. P. Porter.
<i>Press Committee</i>	{ Lowrey Cooling. Marion Lazenby. W. D. Burroughs.

THE POE-LOWELL JUNE PLAY.

The Poe and the Lowell Literary Societies combine each year to present some dramatic performance during the commencement week. In doing this they are actuated by the desire not only to benefit themselves intellectually by the training they receive in preparing for and in producing their play, but also by a desire to give to their friends a pleasant evening, and to bring before the people of Baltimore the literary activities of the Institute.

"The Man from Home," a four-act play by Booth Tarkington, was presented by the combined societies, at Albaugh's Theatre, on the evening of June 14, 1912. The cast was a large one, and was arranged as follows in the order of entrance:

Mariano, Maitre d'hotel.....	E. Raimon Stivers, '12
Michele, a waiter.....	W. Lester Edel, '14
Ribiere, Secretary to the Grand Duke..	J. Frederick Gross, '11
The Earl of Hawcastle.....	E. Russell Hicks, Mid '14
The Countess de Champigny.....	Robert T. Harris, '14
Ethel Granger-Simpson.....	F. H. MacCarthy, Mid '12
The Hon. Almeric St. Aubyn, son of Lord Hawcastle,	
	Thomas H. Hardinge, '14
Horace Granger-Simpson.....	W. Taylor Abercrombie, '13

Lady Creech, sister-in-law of Lord Hawcastle,	
	F. Gloyd Awalt, '14
Valet de Chambre.....	Samuel Wilner, '14
The Grand Duke Vasilio Vasilivitch...	William C. Andrae, '12
Daniel Voorhees Pike, Kokomo, Indiana,	
	Howard J. Schuster, '12
Ivanoff Ivanovitch.....	Frank A. Cesky, '13
First Carabiniere.....	J. Nathaniel Heiner, '13
Second Carabiniere.....	Samuel Wilner, '14

SYNOPSIS.

Act I—The Terrace of the Hotel Regina Margherita on the cliffs at Sorrento. Morning.

Act II—The entrance garden of the Hotel. Afternoon.

Act III—An apartment in the Hotel. Evening.

Act IV—The Terrace. The following morning.

Time—The Present. Scene—Sorrento in Southern Italy.

THE JUNE PLAY COMMITTEE OF 1912.

Mr. William Perry Stedman.....	<i>Stage Manager.</i>
E. Raimon Stivers, '12.....	<i>Chairman.</i>
Abram F. Bacharach, Mid '13.....	<i>Secretary-Treasurer.</i>
E. Russell Hicks, Mid '14..	<i>Costuming and Property Manager.</i>

Lewis W. Miller, '13. Walter V. Harrison, Mid '13.

Solomon Cohen, '13. Carroll F. Morrison, Mid '13.

Alfred S. Niles, Jr., '12. Louis E. Shilling, Mid '13.

W. Taylor Abercrombie, '13.

ATHLETICS.

THE ATHLETIC ASSOCIATION.

The fundamental basis upon which rests the organization of the Athletic Association is the elevation of schoolboy athletics. It seeks to establish honor, self-restraint, and courage above

victory. It provides suitable apparel and safety devices for contestants in order to lessen the chances of injuries, and endeavors to shape the coaching and training on hygienic principles. It permits any student of the Institute to become a candidate for any team or squad which represents the school in athletic contests, provided his scholastic standing is of the required standard.

The Athletic Board is so constituted in membership as to make it thoroughly representative of the student body.

ATHLETIC BOARD.

<i>Honorary President</i>	Principal William R. King.
<i>President</i>	Otto H. Hamm.
<i>Vice-President</i>	Hugh Day.
<i>Secretary</i>	Paul Messersmith.
<i>Treasurer</i>	Mr. Samuel P. Platt.
<i>Historian</i>	Mr. W. T. Ballard.

STUDENT MEMBERS.

R. W. Anderson, '14.	Joseph Jacobs, '14.
C. N. Brill, '15.	R. Lee Porter, Jr., '14.
Milton Constam, '14.	Leslie Sebald, '13.
W. E. Duck, '14.	Louis Weissing, '14.
A. P. Shanklin, '15.	E. O. Born, '16.
J. M. Gillespie, '15.	O. A. Carr, '16.
R. Wright, '15.	

MANAGERS.

Mr. James B. Arthur.	Mr. Clarence P. Bolgiano.
Mr. Wilmer A. Dehuff.	Mr. Howard H. Elliott.
Mr. Julius Zieget.	

SWIMMING.

The season of 1912 was the first in which the Baltimore Polytechnic Institute was represented by an organized swimming team.

Although the team was defeated in dual meets by the Baltimore City College and by the Marston School, the individual members acquired experience which enabled several of them to secure honors in the Interscholastic Championship Meet.

The team was composed of the following:

Clark, Duck, W. Harrison (captain), Hiss, Joyce, Kaiser, Meikle, Platt, Pyle, Schmied, Turner, and Wrenn.

BASEBALL.

The B. P. I. baseball team of 1912 made one of the most creditable records in the sporting annals of the school, having won the interscholastic championship by defeating the team of the Baltimore City College.

The following is a summary of the games played:

The Catholic University.....	7,	Polytechnic	1
Pennsylvania Railroad Y. M. C. A....	2,	Polytechnic	9
Govans Athletic Club.....	2,	Polytechnic	9
College of Physicians and Surgeons (F.)	6,	Polytechnic	12
Strayer's Business College.....	10,	Polytechnic	1
Baltimore Baseball Club.....	17,	Polytechnic	2
Episcopal High School.....	1,	Polytechnic	3
University of Maryland (Dental)....	1,	Polytechnic	12
Johns Hopkins University (Reserves)..	3,	Polytechnic	5
Franklin High School.....	1,	Polytechnic	18
Rock Hill College.....	14,	Polytechnic	7
Baltimore City College.....	6,	Polytechnic	18
Boys' Latin School.....	8,	Polytechnic	9
St. John's College (Reserves).....	6,	Polytechnic	8
Baltimore Medical College (Freshmen).	4,	Polytechnic	4*
Loyola High School.....	9,	Polytechnic	12
Western Maryland College.....	7,	Polytechnic	1
Charlotte Hall Military Academy.....	6,	Polytechnic	10
Baltimore City College.....	4,	Polytechnic	5
McDonough School.....	3,	Polytechnic	4

*Twelve innings, forfeited to the Polytechnic, 9 to 0.

THE TEAM.

E. C. Reynolds.....	}	<i>Pitchers.</i>
O. Travers.....		
E. A. Constam.....		
C. N. Brill.....		
L. B. Platt.....	}	<i>Catchers.</i>
H. S. Ewell.....		
R. W. Anderson.....		<i>First Base.</i>
J. A. Lutz, Jr.....		<i>Second Base.</i>
G. P. Phillips, Jr.....		<i>Third Base.</i>
J. B. Kauffman.....		<i>Short Stop.</i>
O. Travers.....		<i>Left Field.</i>
K. Kelly.....		<i>Center Field.</i>
R. K. Barnes.....		<i>Right Field.</i>

Substitutes: M. S. Dehuff, J. Johnson, W. J. Kellinger, H. B. Harrison, A. A. Renno.

L. F. Magness, Coach.

C. P. Bolgiano, Manager.

FOOTBALL.

The local interscholastic football season of 1912 terminated on November 22, before the largest crowd ever assembled at Homewood Field, Johns Hopkins University, the Polys going down to an honorable defeat at the hands of their City College rivals by the score of 6 to 13, thus losing the interscholastic championship of the city. In all other respects the season was very satisfactory, as the team was ably coached by Messrs. Harry Oehrl and Carlton D. Cann.

After the usual try-out with the Mount Washington Club, the team was decisively beaten by Tome School at Port Deposit. This was followed by six decisive victories, which brought the season up to the final game with the City College.

Summary of games played:

Polytechnic.....	0,	Mount Washington Club.....	13
Polytechnic.....	0,	Tome School.....	37
Polytechnic.....	34,	Govans Athletic Club.....	0
Polytechnic.....	19,	St. John's College Reserves....	0
Polytechnic.....	54,	W. M. College (Second).....	0
Polytechnic.....	14,	Shirley Athletic Club.....	7
Polytechnic.....	20,	Werntz Preparatory School....	0
Polytechnic.....	26,	Charlotte Hall School.....	0
Polytechnic.....	6,	City College.....	13

THE TEAM.

Lutz.....	<i>Left End.</i>
Pumphrey.....	<i>Left Tackle.</i>
Campbell.....	<i>Left Guard.</i>
Messersmith.....	<i>Center.</i>
Freeman.....	<i>Right Guard.</i>
Sebald.....	<i>Right Tackle.</i>
Anderson.....	<i>Right End.</i>
Kelly.....	<i>Quarterback.</i>
Knight (captain).....	<i>Left Halfback.</i>
Day.....	<i>Right Halfback.</i>
Hamm.....	<i>Fullback.</i>

Substitutes: Robinson, Darley, R. Fusselbaugh, Jr., Reardon Fusselbaugh, Taylor, Graham, Harrison, Joyce, Pyle, Stromeier, Heiner, Childs, Wilson, Cann, Wolf.

Manager, Mr. Julius Zieget.

THE MARKSMEN'S CLUB.

The object of the Marksmen's Club is to create among the students an interest in marksmanship, that branch of athletics which develops a steady arm, a quick eye, and a manly self-reliance. It is composed of all the members of the school who can shoot, or who wish to learn to shoot.

The Club is a member of the Inter-City High School Rifle Shooting League of the National Rifle Association, composed of high schools from all over the United States. Sixteen schools participated in the matches during the season of 1912, the B. P. I. winning third place, the Iowa City High School, Iowa, and Deering High School of Portland, Me., winning first and second places, respectively, with 14 victories and 1 defeat each, the B. P. I. following closely with 13 victories and 2 defeats. In shooting off the tie for first place, the Iowa City team not only won first place, but broke the interscholastic record for indoor shooting with a score of 972, thus beating the best previous of 970 made by the B. P. I. during the last week of the matches. It is worthy of note that the only match lost by the champion team was to the B. P. I.

The team in order of merit consisted of:

W. H. Wilhelm,	C. H. Weant,
R. Lee Porter,	R. C. Taylor,
A. D. Fulton,	A. R. Price,
B. Goldberg,	R. J. Stewart,
A. S. McCabe,	W. E. Duck,
J. W. Rice,	E. Klawans.

CATALOGUE OF GRADUATES.

CLASS OF '87.

Clarence G. Bouis,	Joseph H. Kuehn,
George C. Bump,	P. Charles Nelson,
Lucien Dallam,	Flavius J. Pennington,
Otto H. Ehlers,	Richard Piez,
Osma K. Gardner,	Henry M. Price,
Herbert F. Gorgas,	Walter G. Reinicker,
Joseph Greenbaum,	William A. Robertson,
Henry W. Hahn,	Albert Rosenberg,
Minor F. Heiskell,	James B. Scott,
Robert Hooper,	Walter R. Sweeney,
William S. Hugg,	James C. Thompson,
Thomas J. Irons,	Adolphus Tiemeyer,
	Frederick H. Wagner.

CLASS OF '88.

Arthur O. Babendrier,	William Johnston, Jr.,
Edward Binswanger,	William Mencke,
Bernard H. Brooke,	William F. Mylander,
Sydney S. Bouis,	Edwin F. Orem,
Julius Fireman,	Edward B. Passano,
Thomas G. Ford,	George E. Repp,
George M. Gaither,	Harry E. Roberts,
John H. Harvey,	George C. Robinson,
Howard Harvey,	Hanson Robinson,
Walter J. Herman,	Robert E. Rodgers,
Joseph H. Hooper,	George H. Sickel,
John P. Jefferson,	Washington B. Stanton,
	Orlando C. Weeks.

CLASS OF '89.

William F. Ackerman,
Samuel R. Adams,
Morgan H. Baldwin,
Arthur Gordon,
Ernest Griffith,
Isaac Behrend,
Joseph Isaac,
Louis H. Gerding,
Harry M. Ford,
Edward P. Cromwell,
John S. Hand,
Claiborne M. James,
Albert C. Layman,
Charles W. Leach,
J. W. C. Meikle,
Rozier L. Bouis,

Robert H. Buschman,
Charles C. Constantine,
Albert T. Barrett,
John L. Ehrman,
Allyn Field,
Howard Crosby,
George W. Moog,
John K. Mount,
Robert W. Peach,
Charles E. Phelps, Jr.,
William G. Robertson,
Robert C. Round,
Myron S. Rose,
William C. Siegmund,
Joseph Stiefel,
Harry P. Suman,

Carroll Thomas.

CLASS OF '90.

John F. Abendschein,
G. S. Barnes,
J. H. Bokee,
J. Edward Broadbelt,
W. H. Farinholt,
Chris. Feick,
J. Froelich,
William P. Gundry,

E. C. Harris,
J. C. Mattoon,
John D. Pugh,
A. O. Robertson,
William F. Schultz,
Michael D. Schaefer,
William P. Shriver,
Theodore Straus.

CLASS OF '91.

Walter Amos,
Basil Benson,
William Benson,
William Boucsein,
Morde Bren,
John J. Caine,
George Dannetel,
Charles Ehlers,
Ferdinand B. Keidel,

J. Edgar Knipp,
Samuel McNeal,
James C. Phillips,
Herbert M. Reese,
Edmund W. Robinson,
Reuben Row,
Warren S. Seipp,
N. D. D. Sollers,
Richard S. Warner,

William A. Young.

CLASS OF '92.

Edwin W. Antes,	J. W. Dawson, Jr.,
John P. Baer,	Royal R. Duncan,
Frank J. Borie,	Charles R. Durling,
B. Harrison Branch,	Isidor Deutsche,
Leonard Burbank,	Walter H. Eisenbrandt,
William C. Butler, Jr.,	William T. Holmes,
Frank B. Hooper,	J. C. Miller,
Edgar N. King,	Joseph Mullen,
John Langford,	William H. Rose,
Louis Liepman,	Albert G. Singewald,
R. M. Miller,	William H. Soine,
William E. Straus.	

CLASS OF '93.

Theodore H. Ackerman,	Clarence S. Hand,
Herbert Addison,	James F. McShane,
Oregon R. Benson,	Clarence F. Morfit,
Percy Thayer Blogg,	F. H. Phelps,
C. Raymond Carson,	Edwin Schenck,
William John Cochran,	John R. Uhler,
B. C. D'Yarmett,	L. Ismay Van Horn,
Henry M. Fitzhugh,	Charles P. Weishampel,
R. L. Williams.	

CLASS OF '94.

Edward H. Bell,	Herbert A. McGaw,
Albert E. Bowen,	Horace J. Miller,
J. Straith Briscoe,	Louis Mueller,
Harry Cotton,	George M. Parlett,
Carroll Edgar,	Charles Schlicker,
Frederick Kopp,	Alan P. Wilson,
Philip Littig, Jr.,	John Zeubert,
Thomas Q. McGinn,	Pliny Cutler Hall,
Edward J. Herring.	

CLASS OF '95.

George W. Brown,	Edward M. Likes,
Clifton A. Coggins,	Ward P. Littig,
Harry W. Francis,	Alfred F. Loeser,
Graham B. Hall,	Thomas J. H. Magness,
William W. Hogendorp,	Herman F. Myer,
Albert J. Hooper,	George N. Rogers,
Frank A. Hornig,	Hamilton D. Ruth,
Howard L. Hoskins,	Richard F. Weishampel,
	Carl A. Witthaus.

CLASS OF '96.

Samuel Hosea Armstrong,	Ludford Cohoon Jones,
Howard Douglas Bennett,	Leon Alvyn Kohn,
James Gomelia Boss, Jr.,	Erich Albert Loeser,
William Augustine Boykin, Jr.,	Henry Louis Mencken,
Robert Lemmon Burwell,	Harold Vincent Patterson,
Harry Parr Diggs,	Harry Clay Powell, Jr.,
Frederick L. H. Glendmeyer,	Gilmor Meredith Ross,
William Howard Hamilton,	Thomas Quincy Scott,
Arthur Worthington Hawks, Jr.,	Henry Bonn Silverthorn,
Fredk. Worthington von Stein,	William Henry Smith,
Louis Kemp Henninghausen,	Roscoe Conkling Sweeny,
Harry Louis Homer,	Charles Edwin Wilson,
	Olin Alexander Wilson.

CLASS OF '97.

Louis Fabian Bachrach,	Harry L. Kugler,
Alan Marion Bennett,	Chester Waters Larnier,
William Melvin Carter,	Howard Osgood Preston,
Elvin Griswold Cromwell,	George Gottlieb Schnepfe,
John Towson Elsroad, Jr.,	Frederick Lewis Schwartz,
John Montgomery Gambrill,	Joseph Stewart Smith, Jr.,
Ernest Cummins Hatch,	Douglas Alan Sparks,
William Hain Kirwan,	Joseph Morrison Sparks,
	Wilson Ward.

CLASS OF '98.

Thomas Jefferson Andrews,	John Walter McGreevy,
Alan Joseph Bachrach,	Edward Harris Mealy,
Leo Bauerfeld,	William Charles Metcalf,
Wilbur McKnew Bosworth,	John Floyd Miller,
Frederick Derick Dollenberg, Jr.,	William Eldred Nolan,
Romulus Griffith Doyle,	Gurdon Tyler Pollard,
John Howard Flayhart,	Walter Percy Poole,
Henry Galloway,	John Maurice Rehberger,
Charles Raymond Gantz,	John McCullough Rife,
Samuel Thomas Griffith,	Harry Rufus Ruse,
Alfred Cummins Hatch,	Paul Edward Schaun,
William Herman Hubers, Jr.,	John Henry Sirich, Jr.,
Joseph Lowrie Ingle, Jr.,	John Smith,
John Scott Longnecker,	Herbert Turner Snyder,
George Creamer Wilcox.	

CLASS OF '99.

Charles E. Allen,	Harry Lowenthal,
William B. Boettinger,	George P. McCeney,
Harrison Brent,	William E. McCord,
Hugh W. Brent,	Marion H. McCoy,
Edward Goodnow Clayton,	Charles E. Mencken,
Edward P. Cooke,	Charles T. Owens,
Charles C. Crockett,	Edw. L. Schaun,
William W. Cushing,	Harold B. Vincent,
Arthur Councilman Davis,	Joseph A. Ward,
Charles H. Demitz,	Charles C. Lucke,
Roland S. Focke,	John N. McCleester,
Harry B. French,	Blakely A. McDonnell,
Robert B. Harper,	Edwin G. O'Connor,
Charles W. Held,	William Taylor Phipps,
Ira Johnson,	Emanuel J. Sedlacek,
George A. Knapp,	Frederick C. J. Sternat,
Walter B. Lang,	Joseph R. Walter,
William C. Whelan.	

CLASS OF '00.

John Walter Fred. Blizard,	Samuel Moore Johnson,
Roy Stevenson Houck,	Luther Chase Wright,
Galt Fayette Parsons,	Walter Bowen Buttner,
Gustave Frederick Linck,	Morgan Moore,
Horace Kirk Faust,	John Charles Masopust,
Thomas Osborn Wansleben,	Walter Groverman,
Lawrence Gunton Allbutt.	

CLASS OF '01.

Joseph M. Beehler,	Richard E. Marston,
C. Ernest Conway,	Harry Mehrling,
William M. Demitz,	John A. Raidabaugh,
Charles F. Goob,	T. Warden Rinehart,
Richard G. Harris,	William B. Rosenthal,
Irving C. Hess,	Edward Samuel,
Charles W. Hoppert,	John C. Siegle,
Carlisle L. Hubbard,	Walter H. Tapman,
Edward E. Johnston,	Sidney C. Vincent,
Thomas H. Kenny,	George P. von Eiff,
Charles E. Lane,	Ernest B. Walton,
Andrew J. Lowndes,	Arthur S. Weiss,
Ross E. Lynch,	George K. Yost,
Allen L. Malone,	Philip H. Zipp.

POST-GRADUATE CLASS OF '02.

(Four Year Course.)

Joseph M. Beehler,	Allen L. Malone,
C. Ernest Conway,	John A. Raidabaugh,
Irving C. Hess,	Sidney C. Vincent,
Andrew J. Lowndes,	George P. von Eiff,
Philip H. Zipp.	

CLASS OF '02.

Joseph A. Baldwin,
 Frank O. Boyd,
 John B. Cautley,
 Robert Dall,
 William L. De Baufre,
 John K. Flick,
 Walter M. Gieske,
 Donald S. Hays,
 Joseph T. Henthorn,
 John S. Hess,

I. Seeley Jones,
 D. Frank Lamble,
 LeRoy M. Langrall,
 H. Quimby Layman,
 John G. M. Leisenring,
 William N. Michael,
 Charles A. Pettit,
 William S. Samuel,
 G. Forney Shryock,
 Charles F. Yardley.

POST-GRADUATE CLASS OF '03.

(Four Year Course.)

John B. Cautley,
 Robert Dall,
 William L. De Baufre,
 John K. Flick,
 Walter M. Gieske,
 Donald S. Hayes,
 John S. Hess,

I. Seeley Jones,
 LeRoy M. Langrall,
 H. Quimby Layman,
 Specials—
 Arthur C. Davis,
 Charles A. Pettit.

CLASS OF '03.

Elmer Armiger,
 Paul Backhaus,
 Oscar F. Benjamin,
 Owen C. Blades,
 Harry N. Brannan,
 Frank B. Burton,
 William N. Crisp,
 John W. Dorsey, Jr.,
 Christopher J. Frank,
 Milton H. Gross,
 Harold M. Parsons,
 Ernest M. Poole,
 J. McDonnell Reid,
 Martin J. Reynolds,

Edward Hering,
 Charles E. Herth,
 James B. Jones,
 Milton Kraemer,
 Herman Lucke, Jr.,
 Edmund C. Lynch,
 Arthur B. Marston,
 Harry M. Mason, Jr.,
 Sidney Newhoff,
 Manly P. Northam,
 August H. Schaaf,
 Howard I. Schultz,
 George F. W. Sims,
 Wilmer T. Stone.

POST-GRADUATE CLASS OF '04.

(Four Year Course.)

Paul W. Backhaus,
Harry N. Brannan,
William N. Crisp,
Edward Hering,
James B. Jones,
Milton Kraemer,
Harry M. Mason, Jr.,

J. McDonnell Reid,
Martin J. Reynolds,
George F. W. Sims,
Specials—
Frank B. Burton,
H. Milton Gross,
August H. Schaaf.

CLASS OF '04.

Chester A. A. Albrecht,
James B. Arthur,
Marion V. Bailliere,
Joseph Bowes, Jr.,
Andrew K. Brumbaugh,
Clarence C. Clickner,
Edward C. Cromwell,
Frederick L. Dixon,
Charles A. Edel,
Frank B. Fifer,
Emanuel Fritz,
George Gittelsohn,
J. Lyell Gressitt,
Edward J. Hecker,
John H. Hills,
Harry J. Hodes,
Benjamin F. Hoffacker,
Harry V. D. Hunt,
William C. Hurley,
Charles A. Langrall,

Herman W. Lasser,
Daniel J. Leary,
Leon Marmor,
Samuel May,
John L. Mosher,
Charles P. Niederhauser,
Robert G. Pangborn,
Massimo Pisani, Jr.,
George S. Robertson,
George M. G. Schaefer,
Leon Small,
Oscar E. Smith,
Marion Steinberger,
Harry D. Thurlow,
Harry Waldorf,
Charles W. Whittle,
Edwin L. Willson,
Louis A. Witte,
William P. Wittmer,
Alexander H. Woollen.

POST-GRADUATE CLASS OF '05.

Chester A. A. Albrecht,
James B. Arthur,
Joseph Bowes, Jr.,
Edward C. Cromwell,
John W. Dorsey, Jr.,
Charles A. Edel,
Frank P. Fifer,
Emanuel Fritz,
J. Lyell Gressitt,
Richard G. Harris,
Edward J. Hecker,
John H. Hills,

Benjamin F. Hoffacker,
Harry V. D. Hunt,
Charles A. Langrall,
Samuel May,
John L. Mosher,
Robert G. Pangborn,
Massimo Pisani, Jr.,
Leon Small,
Marion Steinberger,
Harry DeG. Thurlow,
Harry Waldorf,
Edwin L. Willson,

Alexander H. Woollen.

CLASS OF '06.

H. Roy Anderson,
Moses Appel,
Walter K. Bachrach,
Harry C. Becker,
J. Ralph Bolgiano,
William Wallace Boyd,
G. Herman Carl,
Willis B. Clemmitt,
Charles H. Dorsey,
George Erck,
Harry C. Finck,
Edwin Friese,
John R. Guttman,
John R. Haswell,
Charles W. Henderson,
George F. Heubeck,
Ralph Holbrook,
Andrew C. Kemler,
Howard G. Lanahan,
George F. Lehmann,

Frank T. Leilich,
Harold M. Lewis,
Bernard A. McAbee,
Carl F. Meyer,
Sidney D. Mitchell,
Ferdinand Oppenheimer,
John G. Pertch, Jr.,
Lewis W. Porter,
John T. Ridgely,
John C. Schirmer,
Edward K. Stenbridge,
David B. Stewart, Jr.,
Levin H. Stewart,
Israel E. Stolberg,
Frank T. Suman,
Nicholas C. Thalheimer,
Raymond M. Weaver,
George F. Wennagel,
George F. Weighardt,
Phillip H. Williamson,

Walter B. Wills.

CLASS OF '07.

Theodore Ascherfeld,
Ludwig Aull,
Emil G. Bauersfeld,
R. M. Bealer,
Alvin M. Bland,
Gustave Bornscheuer,
J. Daniel Brendel,
John N. Childs,
Wilmer A. Dehuff,
C. Lehman Downs,
Herbert S. Fairbank,
F. Donald Fenhagen,
Otto A. Geumann,
Charles E. Grimes.
Henry R. Gundlach,
G. Herman Guttmann,
Carroll R. Harding,
William Hartman,
Horace K. Hayden,
Harry L. Hess,
F. Merrill Hildebrandt,
Fernando Janer,
Harry B. Joyce,
John P. Kenney,
Charles Krausse,

W. H. Kruger, Jr.,
William G. McLaughlin,
Laurence F. Magness,
J. C. Manning,
Lawrence G. Miller,
Charles E. Mitchell,
Serafin M. Montesinos,
George T. Mumma,
Marcus Newhoff,
Samuel P. Nixdorf,
Arthur Norden,
Edwin H. Nordmann,
Charles J. Rasch,
Charles J. Ritterhoff,
Ernest Rodemeyer,
Arthur H. Schultz, Jr.,
Nelson Schuster,
Frederick B. T. Siems,
V. Bernard Siems,
Charles Silver,
Samuel F. Tapman, Jr.,
T. Leonard Walter,
Bernard Wich,
R. Mason Wilhelm,
Julius Zieget.

CLASS OF '08.

Otto E. Adams,
Gelston H. Armstrong,
Clarence P. Bolgiano,
Gilbert F. Bolgiano,
Emmet B. Bryan,
Joseph D. Bullock,
Nathan R. Butler, Jr.,
Walter S. Byrne,
James R. Carroll, Jr.,
Thomas D. Conn,
Percy Davenport,
Franklin Davis,
Arturo Diaz,
Austen Gailey,
Frank Goldenberg,
Eugene E. Graham,
T. Douglas Gresham,
R. Milton Hall,
Walter L. Heathcote,
Walter F. Heise,
Harry C. Hess,
Harry W. Hill,
Milton A. Hodes,
Abraham A. Hollander,
Henry J. Horn,
Raymond H. Hoskins,
Henry A. Israel,
Wilbur C. Jackson.

Manuel Janer,
Charles R. Justi,
Laurence A. Kahn,
Walter E. Lee,
Andrew H. Lemmon,
Frederick W. Lieberknecht,
Thomas W. Manning,
Richard C. Meyer,
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Norman F. Rigor,
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Othello Schroedl,
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Otto Sima,
Benjamin F. Starr, Jr.,
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Franklin E. Holland,
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Albert H. Samuel,
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Charles L. Steel,
George W. Tall, Jr.,
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Ira L. Berg,
E. Ellsworth Hall,
Frederick Hall Jones,
George W. Kelly,
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Wilson T. Ballard,	James H. McKay,
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Charles P. Bartgis,	Walter Mason,
J. G. Bauernschmidt,	Samuel H. Mazer,
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William T. Brooks,	Milton A. Poster,
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Edgar H. Dix, Jr.,	Gordon Robinson,
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Howard H. Elliott,	Ernest C. Shaun,
J. George Forster, Jr.,	John F. Sendelbach,
Donald Frames,	Aaron L. Shalowitz,
Benjamin Goodman,	John Shoolbred, Jr.,
Leroy S. Green,	W. Carleton Short,
S. T. W. Green,	Alfred B. Smith,
J. Frederick Gross,	G. Nelson Sohl,
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Harry B. How,	George W. Steinmetz,
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J. Dennis Kavanaugh,	W. Elwood Vail,
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Frederick M. Kipp, Jr.,	L. Earl Wilson,
Samuel J. Krotee,	L. Victor Winchester,
Owens Laws,	Harry M. Wood,
Arthur B. Leonard,	Conrad Zieget, Jr.,
Sigmund J. Leskawa,	Julius O. Ziegfeld.

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Framed portrait of DR. HENRY A. ROWLAND. Presented to the Institute by the Fourth Year Class of 1903.

Framed picture illustrating the Bessemer process. Presented by the June Class of 1911.

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